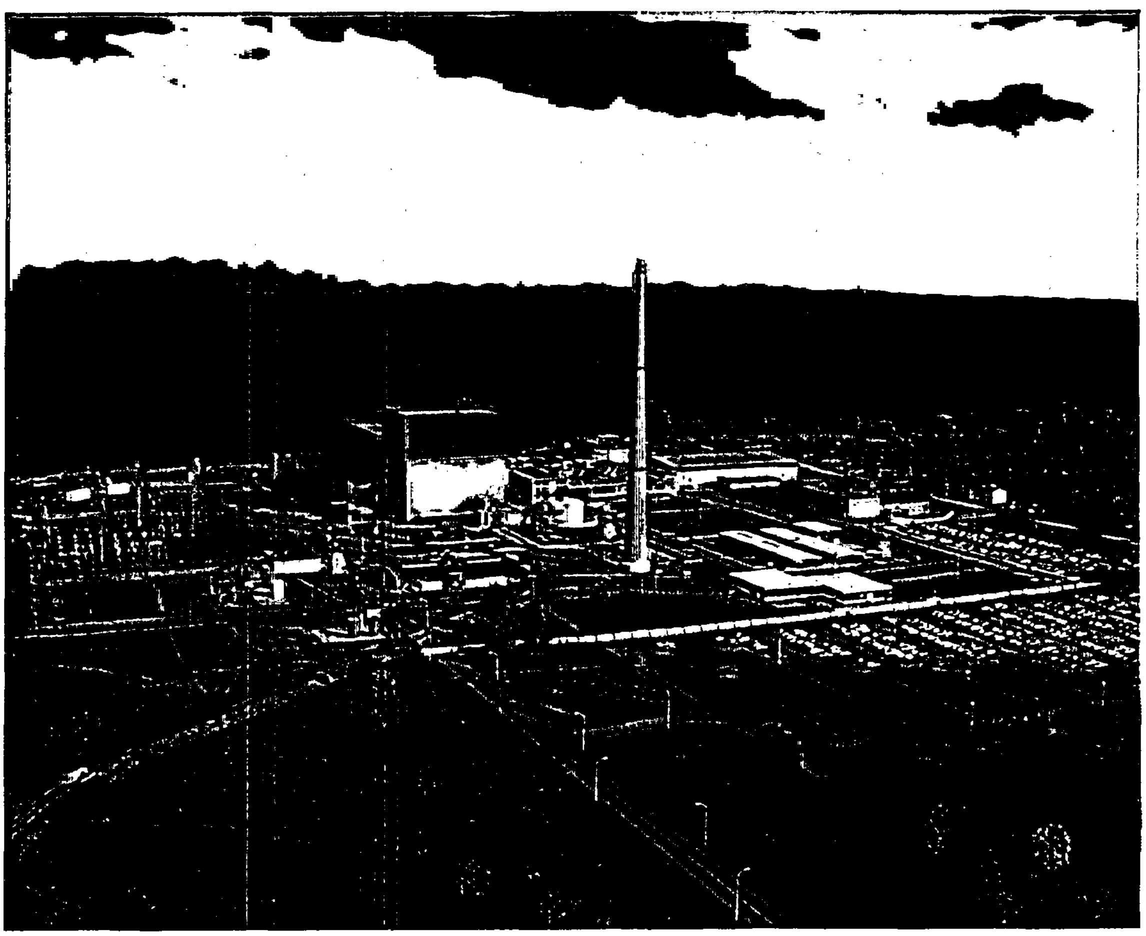
Entergy

LICENSE RENEWAL APPLICATION



JAMES A. FITZPATRICK NUCLEAR POWER PLANT

PREFACE

The following describes the information location, layout, and editorial conventions in the James A. FitzPatrick Nuclear Power Plant (JAFNPP) License Renewal Application (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 JAFNPP Updated Final Safety Analysis Report.

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 2.2-1a, 2.2-1b 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 in 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) containment, structures, and component supports, and (6) electrical and instrumentation and controls. The tables in Section 3 provide a summary of information concerning aging effects requiring management and applicable aging management programs for 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 1, U.S. Nuclear Regulatory Commission, September 2005. The tables include comparisons with the evaluations documented in NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 1, U.S. Nuclear Regulatory Commission, September 2005.

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 confirms that no 10 CFR 50.12 exemption involving a time-limited aging analysis as defined in 10 CFR 54.3 is required during the period of extended operation. The information in Section 4 fulfills the requirements in 10 CFR 54.21(c).

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

Appendix C 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 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	administrative building ventilation and cooling
AC	alternating current
ACI	American Concrete Institute
ACSR	aluminum conductor steel reinforced
ADMIN	administration and control room building
ADS	automatic depressurization system
AEM	aging effect/mechanism
AHU	air handling unit
AMP	aging management program
AMR	aging management review
ANSI	American National Standards Institute
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
B&PV	Boiler and Pressure Vessel
BWR	boiling water reactor
BWRVIP	Boiling Water Reactor Vessel and Internals Program
CAD	containment air dilution
CASS	cast austenitic stainless steel
CE	conducts electricity
CEOG	Combustion Engineering Owners Group
CF	chemistry factor
CFR	Code of Federal Regulations
CII	containment inservice inspection

Abbreviation or Acronym	Description
CLB	current licensing basis
CO_2	carbon dioxide
CP	containment purge
CRD	control rod drive
CRDRL	control rod drive return line
CRHV	control room ventilation and cooling
CS	core spray
CST	condensate storage tank
Cu	copper
CUF	cumulative usage factor
C_VUSE	Charpy upper-shelf energy
CW	circulating water
DBA	design basis accident
DC	direct current
DHR	decay heat removal
ECCS	emergency core cooling system
EDG	emergency diesel generator
EDGV	EDG building heating, ventilation and air conditioning
EFPY	effective full power years
EIC	electrical and instrumentation and control
EBAY	electric bay
EMA	equivalent margin analysis
EN	shelter or protection
EPIC	Emergency Plant Information Computer
EOL	end of life
EPRI	Electric Power Research Institute
EQ	environmental qualification

Abbreviation or Acronym	Description
ER	Environmental Report (Applicant's Environmental Report—Operating License Renewal Stage)
ES	extraction steam
ESF	engineered safety features
ESW	emergency service water
ext	external
FAC	flow-accelerated corrosion
FB	fire barrier
FC	flow control
FD	flow distribution
F_{en}	fatigue life correction factor
FERC	Federal Energy Regulatory Commission
FF	fluence factor
FLB	flood barrier
FLT	filtration
FLV	floodable volume
FP	fire protection
FPCC	fuel pool cooling and cleanup
FSAR	Final Safety Analysis Report
ft-lb	foot-pound
FW	feedwater
GALL	NUREG-1801, Generic Aging Lessons Learned Report
GE	General Electric
GL	Generic Letter
GRP	gaseous release path
GSI	Generic Safety Issue

Abbreviation or Acronym	Description
HBAY	feedwater heater bay
HCU	hydraulic control unit
HELB	high-energy line break
HEPA	high efficiency particulate absolute
HPCI	high pressure coolant injection
HPSI	high pressure safety injection
HS	heat sink
HT	heat transfer
HVAC	heating, ventilation, and air conditioning
HWC	hydrogen water chemistry
I&C	instrumentation and controls
IASCC	irradiation-assisted stress corrosion cracking
ID	inside diameter
IGSCC	inter-granular stress corrosion cracking
IN	Information Notice, insulation (electrical)
INS	insulation
int	internal
IPA	integrated plant assessment
IR	insulation resistance
IRM	intermediate range monitoring
ISG	Interim Staff Guidance
ISI	inservice inspection
ISP	Integrated Surveillance Program
JAFNPP	James A. FitzPatrick Nuclear Power Plant
KV or kV	kilo-volt

Abbreviation or Acronym	Description
LCO	limiting condition for operation
LOCA	loss of coolant accident
LPCI	low pressure coolant injection
LPRM	local power range monitors
LR	license renewal
LRA	license renewal application
MB	missile barrier
MEB	metal-enclosed bus
MG	motor-generator
MIC	microbiologically influenced corrosion
MS	main steam
MSIV	main steam isolation valve
MSLCS	main steam leak collection system
MWe	megawatts-electric
MWt	megawatts-thermal
N_2	nitrogen
NA	neutron absorption, not applicable
n/cm^2	neutrons per square centimeter
NDE	non-destructive examinations
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
Ni	nickel
NMCA	noble metal chemical addition
NPS	nominal pipe size
NRC	Nuclear Regulatory Commission
NSW	normal service water
NYPA	New York Power Authority

Abbreviation or Acronym	Description
O_2	oxygen
OGH	off-gas – holdup
PASNY	Power Authority of the State of New York
PASS	post-accident sampling system
PB	pressure boundary
PC	primary containment
pH	potential of hydrogen
PLT	plateout
ppb	parts per billion
ppm	parts per million
PRM	process radiation monitor
PSPM	periodic surveillance and preventive maintenance
P-T	pressure-temperature
PT	penetrant testing
PTS	pressurized thermal shock
PVC	polyvinyl chloride
PWR	pressurized water reactor
QA	quality assurance
RBCLCW	reactor building closed loop cooling water
RBV	reactor building ventilation
RCIC	reactor core isolation cooling
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RG	Regulatory Guide
RHR	residual heat removal

Abbreviation or Acronym	Description
RHRSW	residual heat removal service water
RO	refueling outage
RPV	reactor pressure vessel
RR	reactor recirculation
RRHV	relay room ventilation and cooling
RT_{NDT}	reference temperature (nil-ductility transition)
RVID	Reactor Vessel Integrity Database
RW	radioactive waste
RWC	relay room chilled water system
RWCU	reactor water cleanup
S_A	stress allowables
SBO	station blackout
SBRV	station battery room ventilation and cooling
SCBA	self-contained breathing apparatus
SCC	stress corrosion cracking
SE, SER	Safety Evaluation, Safety Evaluation Report
SFP	spent fuel pool
SGT	standby gas treatment system
SIF	stress intensification factor
SIV	safety injection valve
SLC	standby liquid control
SNS	support for Criterion (a)(2) equipment
SO_2	sulfur dioxide
SR	surveillance requirement
SRE	support for Criterion (a)(3) equipment
SRM	source range monitoring
SRV	safety/relief valve
SS	sample system, stainless steel

Abbreviation or Acronym	Description
SSC	system, structure, or component
SSR	support for Criterion (a)(1) equipment
SW	service water
STR	structural integrity
TLAA	time-limited aging analysis (analyses)
TB	turbine building
TBCLC	turbine building closed loop cooling
TBV	turbine building ventilation
TIP	traversing incore probe
TS	Technical Specifications
TSC	Technical Support Center
UFSAR	Updated Final Safety Analysis Report
USE	upper-shelf energy
UT	ultrasonic testing
VFLD	vessel flange leak detection
yr	year
Zn	zinc
1/4 T	one-fourth of the way through the vessel wall measured from the internal surface of the vessel

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1.0 ADMINISTRATIVE INFORMATION

Pursuant to Part 54 of Title 10 of the Code of Federal Regulations (10 CFR 54), this application seeks renewal for an additional 20-year term of the facility operating license for James A. FitzPatrick Nuclear Power Plant (JAFNPP). The facility operating license (DPR-59) expires at midnight October 17, 2014. 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 1, September 2005, and Regulatory Guide 1.188, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses," Revision 1, September 2005, and guidance provided by 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 JAFNPP.

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 Applicants

Entergy Nuclear FitzPatrick, LLC
Entergy Nuclear Operations, Inc.

1.1.2 Address of Applicants

Entergy Nuclear FitzPatrick, LLC
FitzPatrick Nuclear Power Station
268 Lake Road East
Lycoming, New York 13093

Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, New York 10601

1.1.3 Description of Business of Applicants

Entergy Nuclear FitzPatrick, LLC, is engaged principally in the business of owning all or part of a nuclear power facility and selling electric energy at wholesale in the United States. Entergy Nuclear Operations, Inc., is engaged principally in the business of operating nuclear power facilities. These entities are hereinafter referred to as "the applicants."

1.1.4 Legal Status and Organization

Entergy Nuclear FitzPatrick, LLC, a Delaware limited liability company, is an indirect wholly owned subsidiary of Entergy Corporation, and an indirect wholly owned subsidiary of Entergy Nuclear Operations, Inc. The principal office is located in Lycoming, New York.

Entergy Nuclear Operations, Inc., a Delaware corporation, is an indirect wholly owned subsidiary of Entergy Corporation, and a direct wholly owned subsidiary of Entergy Holding Company #2. The principal place of business is located in White Plains, New York.

Entergy Nuclear FitzPatrick, LLC, and Entergy Nuclear Operations, Inc., are not owned, controlled, or dominated by any alien, a foreign corporation, or foreign government. Entergy Nuclear FitzPatrick, LLC, and Entergy Nuclear Operations, Inc., make this application on their own behalf and are not acting as an agent or representative of any other person.

Entergy Nuclear FitzPatrick, LLC, has no board of directors. It is governed by a management committee comprising Gary J. Taylor only.

The names and addresses of the principal officers of Entergy Nuclear FitzPatrick, LLC, are as follows.

Gary J. Taylor Chief Executive Officer and Chief Nuclear Officer	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
Leo P. Denault Executive Vice President and Chief Financial Officer	Entergy Corporation 500 Clinton Center Drive Clinton, Mississippi 39056
Steven C. McNeal Vice President and Treasurer	Entergy Corporation 20 Greenway Plaza Houston, Texas 77046
Robert D. Sloan Executive Vice President, General Counsel and Secretary	Entergy Corporation 500 Clinton Center Drive Clinton, Mississippi 39056
Michael R. Kansler President - Entergy Nuclear Operations, Inc.	Entergy Nuclear Operations, Inc. 440 Hamilton Avenue White Plains, New York 10601
John T. Herron Sr. Vice President and Chief Operating Officer	Entergy Nuclear Operations, Inc. 440 Hamilton Avenue White Plains, New York 10601

The names and addresses of the Directors of Entergy Nuclear Operations, Inc., are as follows.

Gary J. Taylor Chief Executive Officer and Chief Nuclear Officer	Entergy Operations Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
Michael R. Kansler President - Entergy Nuclear Operations, Inc.	Entergy Nuclear Operations, Inc. 440 Hamilton Avenue White Plains, New York 10601
Leo P. Denault Executive Vice President and Chief Financial Officer	Entergy Corporation 500 Clinton Center Drive Clinton, Mississippi 39056

The names and addresses of the principal Officers of Entergy Nuclear Operations, Inc., are as follows.

Gary J. Taylor Chief Executive Officer and Chief Nuclear Officer	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
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Steven C. McNeal Vice President and Treasurer	Entergy Corporation 20 Greenway Plaza Houston, Texas 77046
Michael R. Kansler President - Entergy Nuclear Operations, Inc.	Entergy Nuclear Operations, Inc 440 Hamilton Avenue White Plains, New York 10601
John T. Herron Sr. Vice President and Chief Operating Officer	Entergy Nuclear Operations, Inc 440 Hamilton Avenue White Plains, New York 10601
Oscar Limpias Vice President, Engineering – Northeast	Entergy Nuclear Operations, Inc 440 Hamilton Avenue White Plains, New York 10601
C. Randy Hutchinson Sr. Vice President, Business Development	Entergy Nuclear, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
Robert D. Sloan Executive Vice President, General Counsel and Secretary	Entergy Corporation 500 Clinton Center Drive Clinton, Mississippi 39056

Michael A. Balduzzi Vice President – Pilgrim Nuclear Power Station	Pilgrim Nuclear Power Station 600 Rocky Hill Road Plymouth, Massachusetts 02360
Fred R. Dacimo Vice President – Indian Point Energy Center	Indian Point Energy Center 295 Broadway, Suite 1 P.O. Box 249 Buchanon, New York 10511
Randall K. Edington Vice President – Operations Support	Cooper Nuclear Power Station 1200 Prospect Road P.O. Box 98 Brownville, Nebraska 68321
Peter T. Dietrich Vice President – FitzPatrick Nuclear Power Station	FitzPatrick Nuclear Power Station 268 Lake Road East Lycoming, New York 13093
Theodore A. Sullivan Vice President – Vermont Yankee Nuclear Power Station	Entergy Nuclear Vermont Yankee 320 Governor Hunt Road Vernon, Vermont 05354

1.1.5 Class and Period of License Sought

The applicants request renewal of the facility operating license for JAFNPP (facility operating license DPR-59) for a period of 20 years. The license was issued under Section 104b of the Atomic Energy Act of 1954 as amended. License renewal would extend the facility operating license from midnight October 17, 2014, to midnight October 17, 2034.

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 applicants do 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

Securities and Exchange Commission
450 Fifth Street NW
Washington, DC 20549

The JAFNPP license renewal will require approval of the New York Public Service Commission. The address of this state commission is as follows.

New York Public Service Commission
Empire State Plaza
Agency Building 3
Albany, New York 12223

1.1.8 Local News Publications

The trade and news publications which circulate in the area surrounding JAFNPP, 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.

Palladium Times
140 West First Street
Oswego, New York 13126

The Post Standard
Clinton Square
PO Box 4915
Syracuse, New York 13221

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-63) for JAFNPP 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. 10, lists JAFNPP operating license number DPR-59. The applicants request that conforming changes be made to Article VII of the indemnity agreement, and Item 3 of the Attachment to that agreement, specifying the extension of agreement until the expiration date of the renewed JAFNPP facility operating license sought in this application. In addition, should the license number be changed upon issuance of the renewal license, the applicants request 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 applicants do not expect that any activity under the renewed license for JAFNPP will involve such information. However, if such information were to become involved, the applicants agree that it will appropriately safeguard such information and not 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 JAFNPP site is on Lake Ontario in Oswego County, approximately seven miles northeast of the City of Oswego. JAFNPP employs a General Electric boiling water reactor nuclear steam supply system licensed to generate 2536 megawatts-thermal (MWt), 881 megawatts-electric (MWe). The current facility operating license for JAFNPP expires at midnight October 17, 2014. The principal buildings and structures at JAFNPP consist of the reactor building, turbine building with electrical and heater bays, administration building and control room, radioactive waste building, screenwell-pumphouse building with intake and discharge tunnels and structures, diesel generator building, auxiliary boiler building, main stack, and independent spent fuel storage installation (ISFSI).

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 in the JAFNPP 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 controls systems.

Table 2.0-1 gives the expanded definitions of intended functions used in this application for structures and components. The tables in the application may refer to either the intended function name or to the abbreviation.

The term "piping" in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. If such components have unique tag numbers or the specific component has a function other than pressure boundary, then flow elements, orifices and thermowells are identified as a separate component type.

The term "heat exchanger (shell)" may include the bonnet/channel head and tubesheet. In cases where the bonnet/channel head and tubesheet provide a unique material and environment combination, they will be uniquely identified as a separate component type.

The general component type of "tank" includes components identified as tanks or accumulators on license renewal drawings.

Table 2.0-1
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 safety-related equipment (including 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 the control of flow rate or establish a pattern of spray.
FD	Flow distribution	Provide a distribution of flow.
FLB	Flood barrier	Provide protective barrier for internal/external flood events.
FLT	Filtration	Provide the removal of unwanted material.
FLV	Floodable volume	Maintain the 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.
GRP	Gaseous release path	Provide path for release of filtered and unfiltered gaseous discharge
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 the 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. This function includes maintaining structural integrity and preventing leakage or spray for 54.4(a)(2).

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

Abbreviation	Intended Function	Definition
PLT	Plateout	Provide holdup and plateout of fission products
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)).
SRE	Support for Criterion (a)(3) equipment	Provide structural or functional support to equipment required to meet the Commission's regulations for the five regulated events in 10 CFR 54.4(a)(3).
SSR	Support for Criterion (a)(1) equipment	Provide structural or functional support for safety-related equipment.
STR	Structural integrity	Maintain structural integrity such that loose parts are not introduced into the system.

2.1 SCOPING AND SCREENING METHODOLOGY

2.1.1 Scoping Methodology

The license renewal rule (10 CFR 54) defines the scope of license renewal. Regulation 10 CFR 54.4(a) (Reference 2.1-1) 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* (Reference 2.1-5), 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 JAFNPP 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 JAFNPP equipment database was used to develop a list of plant systems. The equipment database is a controlled list of plant systems and components, with each component assigned to one plant system.

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. (Structural commodities associated with mechanical systems, such as pipe hangers and insulation, are evaluated with the structural bulk commodities.) Defining a system by the components in the database is consistent with the evaluations performed for maintenance rule scoping and for the determination of system safety functions.

As the starting point for structural scoping, a list of plant structures was developed from a review of the UFSAR (particularly Section 12), plant layout drawings and maintenance rule documentation. The structures list includes all 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., foundations for freestanding tanks and electrical manholes).

Intended functions for structures and mechanical systems were identified based on reviews of applicable plant licensing and design documentation. Documents reviewed included applicable sections of the UFSAR, Technical Specifications, the Safety System Function Sheets, the Fire Hazards Analysis, the Safe Shutdown Analysis, design basis documents, maintenance rule 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 against the nonsafety-related SSCs affecting safety-related SSCs criterion, 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 systems and structures are presented in Section 2.2.

Because the aging management review differed for mechanical and electrical equipment, the scoping of mechanical and electrical systems was treated differently. For the purposes of system level scoping, all plant electrical and instrumentation and control systems are included in the scope of license renewal. Electrical and instrumentation and control components in mechanical systems were included in the evaluation of electrical systems. See Section 2.5 for additional information on electrical and instrumentation and control system scoping and screening.

2.1.1.1 Application of Safety-Related Scoping Criteria

Systems and structures that perform safety functions as defined by the functions listed in 10 CFR 54.4(a)(1) are within the scope of license renewal. Design basis events are defined in 10 CFR 50.49(b)(1) 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).

Component and structure quality classifications are controlled by corporate and site procedures. Together, the procedures define design basis events consistent with 10 CFR 50.49 (b)(1) and define safety-related, or quality assurance Category I, to include safety-related systems, structures, and components (SSCs) that are necessary to ensure, during and following design basis events,

- 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 that could result in potential off-site exposures comparable to the guidelines of 10 CFR 100.

This is the same as 10 CFR 54.4 with the exception of the guidelines cited for off-site exposures. In addition to the guidelines of 10 CFR 100, 10 CFR 54.4(a)(1)(iii) references the dose guidelines of 10 CFR 50.34(a)(1) and 10 CFR 50.67(b)(2). The exposure guidelines of 10 CFR 50.34(a)(1) are not applicable since the JAFNPP construction permit was issued before January 10, 1997. The exposure guidelines of 10 CFR 50.67(b)(2) address the alternate source term, which JAFNPP has credited in the refueling accident analysis. A review was performed of the systems and components that are credited in this limited use of 10 CFR 50.67 to ensure the applicable systems and components were included in the scope of the license renewal.

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, structures, and components whose failure could prevent satisfactory accomplishment of a safety function. The method used was based on guidance provided in Appendix F of NEI 95-10 (Reference 2.1-5). 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 impacts of nonsafety-related SSC failures were considered as either functional or physical. A functional failure is one where the failure of a nonsafety-related SSC to perform its normal function impacts a safety function. A physical failure is one where a safety function is impacted by the loss of structural or mechanical integrity of a nonsafety-related SSC in physical proximity to a safety-related component.

2.1.1.2.1 <u>Functional Failures of Nonsafety-Related SSCs</u>

At JAFNPP, SSCs required to perform a function in support of safety-related components are generally classified as safety-related and included in the scope of license renewal per Section 2.1.1.1. For the few exceptions where nonsafety-related components are required to remain functional to support a safety function, this system intended function is identified in Section 2.3 and the components are included in the appropriate aging management review. [1]

2.1.1.2.2 Physical Failures of Nonsafety-Related SSCs

Based on the license renewal rule and the guidance in NEI 95-10 (Reference 2.1-5), physical failures of nonsafety-related SSCs in scope based on 10 CFR 54.4(a)(2) fit into the following categories:

- nonsafety-related SSCs directly connected to safety-related SSCs (typically piping and HVAC ductwork); *or*
- nonsafety-related SSCs with the potential for spatial interaction with safety-related SSCs.

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

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. In this case, the scope of license renewal includes the nonsafety-related piping and supports up to and including the first seismic or equivalent anchor beyond the safety/nonsafety interface such that the safety-related portion of the piping will be able to perform its intended function. For piping in this structural boundary, pressure integrity is not required; however, piping within the safety class pressure boundary depends on the structural boundary piping and supports in order for the system to fulfill its safety function. For JAFNPP, "structural boundary" is defined as the portion of a piping system outside the safety class pressure boundary yet relied upon to provide structural support for the pressure boundary.

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

The following sections address the different modes of spatial interaction that were considered. Interactions can occur in the following forms:

- physical impact (e.g., seismic Class II/I) or flooding,

1. These systems include containment equipment drains, vacuum priming and air removal, and off-gas portion of gas handling (all three support SGT); fuel pool cooling and cleanup (supports secondary means of pool makeup); RHR (NSR portions support fuel pool cooling); condensate storage (supports ECCS); and main steam (supports main steam leak collection system).

- pipe whip, jet impingement, or harsh environment resulting from a piping rupture, or

- damage due to leakage or spray from nonsafety-related SSCs.

Protective features (whip restraints, spray shields, supports, missile or flood barriers, etc.) are installed to protect safety-related SSCs against spatial interaction with nonsafety-related SSCs. Such protective features credited in the plant design are included within the scope of license renewal and are subject to aging management review. Protective features are typically associated with a structure and are addressed in the structural aging management reviews.

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.

Nonsafety-related supports for non-seismic or Seismic II/I piping systems and electrical conduit and cable trays with a potential for spatial interaction with safety-related SSCs are subject to aging management review based on the criterion of 10 CFR 54.4(a)(2). These supports and components are addressed in a commodity fashion within the civil/structural section.

Based on earthquake experience data, including experience with aged pipe, the following conclusions can be made.

- No experience data exists of welded steel pipe segments falling due to a strong motion earthquake.

- Falling of piping segment is extremely rare and only occurs when there is a failure of the supports.

- These observations hold for new and aged pipe.

Piping supports for Seismic II/I piping need to be intact in order to prevent physical impacts on safety-related equipment during a seismic event and as a result must be included within the scope of license renewal per 10 CFR 54.4(a)(2).

Therefore, as long as the effects of aging on the supports for these piping systems are managed, falling of piping sections, except for flow-accelerated corrosion (FAC) failures, is not considered credible, and the piping section itself would not be in scope for 10 CFR 54.4(a)(2) due to the physical impact hazard (although the leakage or spray hazard may still apply).

Missiles can be generated from internal or external events such as failure of rotating equipment. Inherent nonsafety-related features that protect safety-related equipment from missiles require aging management review based on the criterion of 10 CFR 54.4(a)(2).

Overhead-handling systems whose structural failure could result in damage to any system that could prevent the accomplishment of a safety function meet the criteria of 10 CFR 54.4(a)(2) and are within the scope of license renewal.

Walls, curbs, dikes, doors, etc., that provide flood barriers to safety-related SSCs 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 the relevant site documentation. JAFNPP high energy systems were evaluated to ensure identification of components that are part of nonsafety-related high energy lines that can effect safety-related equipment.

If a high-energy line break (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 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 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 housing safety-related equipment are assumed to also house nonsafety-related equipment within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2). These structures are considered to meet the criteria of 10 CFR 54.4(a)(2) and 10 CFR 54.4(a)(1).

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 in 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 equipment based on functional requirements defined in 10 CFR 50.48. SSCs credited with fire prevention, detection and mitigation in areas containing equipment important to safe operation of the plant are in scope as is equipment credited to achieve safe shutdown in the event of a fire. To identify this equipment, a detailed review of the JAFNPP current licensing basis for fire protection was performed and the systems and structures relied upon for compliance with the Commission's regulations were identified.

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

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. 10 CFR 50.49 codified requirements for the environmental qualification of electrical equipment that had been presented in other regulatory documents such as Bulletin 79-01B. The JAFNPP equipment qualification program satisfies these requirements.

As described in Section 2.1.1 of this application, a bounding scoping approach is used for electrical equipment. Electrical systems and electrical equipment in mechanical systems are by default included in scope for license renewal. Consequently, the environmentally qualified equipment is in scope for license renewal.

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

The PTS rule, 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events," requires that licensees of pressurized water reactors evaluate the reactor vessel beltline materials against specific criteria to ensure protection from brittle fracture. As a boiling water reactor, JAFNPP 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.

Based on JAFNPP current licensing bases for ATWS, mechanical system intended functions performed in support of 10 CFR 50.62 requirements were determined. As discussed in Section 2.1.1, a bounding approach to scoping is used for electrical equipment. Electrical and instrumentation and control (EIC) systems and electrical equipment in mechanical systems are by default included in scope for license renewal. 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 a station blackout (SBO). As defined by 10 CFR 50.2, a station blackout is the loss of offsite and onsite emergency 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.

JAFNPP 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.

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

As described in Section 2.1.1, a bounding approach to scoping is used for electrical equipment. On-site electrical systems and electrical equipment in mechanical systems are by default included in scope for license renewal. Consequently, electrical equipment that supports the requirements of 10 CFR 50.63 is included in the scope of license renewal.

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. 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.

(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 [current licensing basis] for the period of extended operation.

NEI 95-10 (Reference 2.1-5) 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 JAFNPP 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 are either active or subject to replacement based on a qualified life do not require aging management review.

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

For each mechanical system within the scope of license renewal, the screening process identified those components that are subject to aging management review. Section 2.3 presents the results for mechanical systems.

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

Within the system, long-lived components that perform or support an intended function without moving parts or a change in configuration or properties (passive) are subject to aging management review.

In making the determination that a component is passive, 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 perform an intended function by maintaining the pressure boundary and therefore are subject to aging management review.

If the component is not subject to replacement based on qualified life or specified time period, then it is considered long-lived. 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 (i.e., not long-lived) are not subject to aging management review.

Where flexible elastomer hoses/expansion joints are periodically replaced, these components are not long-lived and therefore 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 in physical proximity to a safety-related component.

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.

Each mechanical system safety-related to nonsafety-related interface was reviewed to identify the components located between the safety-related/nonsafety-related interface and the first structural boundary which includes the seismic anchors, or the bounding approach described in NEI 95-10 Appendix F was used. Connected lines were traced back to the nearest point that could conservatively be considered an end point, such as a base-mounted component, flexible connection, or end of a piping run (such as a drain line). Components required or conservatively considered to provide structural support for safety-related portions of systems are subject to aging management review.

The following modes of spatial interaction are described in Section 2.1.1.2.

Physical Impact or Flooding

The evaluation of physical interactions due to physical impact or flooding affects only structures and structural components. This includes overhead-handling systems whose failure could result in damage to a system that could prevent the accomplishment of a safety function as well as walls, curbs, dikes, doors, etc., that provide flood barriers to safety-related equipment. 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 this 54.4(a)(2) review, the JAFNPP UFSAR and associated site documentation was reviewed.

High-energy systems were included in the 10 CFR 54.4(a)(2) review to ensure any components that are part of nonsafety-related high energy lines that can affect safety-related equipment were identified as subject to aging management review. Components in these high-energy lines are included in the appropriate 2.3.3-14 system table.

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.

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 (with the exception of those systems in scope for 10 CFR 54.4(a)(2) for physical interactions, as discussed below). In addition, the drawings identify components that are subject to aging management review. Boundary flags are used in conjunction with safety-to-nonsafety class breaks to identify the system intended function boundaries. Boundary flags are noted on the drawings as system intended function boundaries. Components within these boundary flags and class breaks 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 system aging management review evaluated the components.

Drawings that contain only highlighting (no boundary flags) indicate that all components on the drawing support system intended functions unless excluded by safety-to-nonsafety class breaks.

Flexible elastomer hoses/expansion joints that are periodically replaced (not long-lived) 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 but do support a system intended function. To improve the legibility of the drawings, these components are not marked individually on the drawing using boundary flags.

The determination of whether a component meets the 10 CFR 54.4(a)(2) scoping criterion is based on where structural/seismic boundaries exist, or where the component is located in a building, whether it contains gas or liquid, and its proximity to safety-related equipment. At JAFNPP, a conservative spaces approach for scoping in accordance with 10 CFR 54.4(a)(2) included almost all mechanical systems within the scope of license renewal (see Table 2.3.3.14-A). Providing drawings highlighting in-scope (a)(2) components would not provide significant additional information since the drawings do not indicate proximity of components to safety-related equipment and do not identify structural/seismic boundaries.

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, design drawings, general arrangement drawings, penetration drawings, and the UFSAR to identify specific structural components and commodities that make up the structure. Structural components and commodities subject to aging management review are those that perform an intended function without moving parts or a change in configuration or properties (i.e., passive), and are not subject to replacement based on qualified life or specified time period (i.e., long-lived). Since structures are inherently passive, and with few exceptions are long-lived, the screening of structural components and commodities was based primarily on whether they perform an intended function.

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
- threaded fasteners
- concrete

- fire barriers
- other materials

2.1.2.2.2 Evaluation Boundaries

Structural components and commodities that are attached to a structure or reside within a structure are generally categorized as either component supports or other structural members.

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., 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 and conduit supports, 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. Structural component and commodity intended functions include providing shelter or protection; providing structural or functional support; and serving as barriers for fire, flood, or HELB. NEI 95-10 (Reference 2.1-5) provides guidelines for determining the intended functions of structures, structural components and commodities. These intended functions are included in Table 2.0-1.

2.1.2.3 Electrical and Instrumentation and Control Systems

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. The JAFNPP electrical commodity groups were identified and cross-referenced to the appropriate NEI 95-10 commodity, which identified the passive commodity groups.

Two passive electrical and I&C commodity groups were identified 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 electrical and I&C penetration assemblies.

Other electrical and I&C commodity groups are active and do not require aging management review.

The pressure boundary function that may be associated with some electrical and I&C components identified in NEI 95-10 Appendix B (e.g., flow elements, vibration probes) was considered in the mechanical aging management reviews, as applicable. Electrical components are supported by structural commodities (e.g., cable trays, conduit and cable trenches), which are included in the structural aging management reviews.

2.1.2.3.2 Long-Lived Screening

Electrical components included in the environmental qualification (EQ) program per 10 CFR 50.49 are replaced based on qualified life and, therefore, per 10 CFR 54.21(a)(1)(ii) are not subject to aging management review. The result is that the aging management reviews involve only non-EQ electrical and I&C components.

EQ evaluations are time-limited aging analyses and are addressed in Section 4.4.

2.1.2.4 Consumables

Consumables include such short-lived items as packing, gaskets, component seals, O-rings, structural sealants, oil, grease, component filters, system filters, fire extinguishers, fire hoses, and air packs. Items potentially treatable as consumables have been evaluated consistently 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.

Based on ANSI B31.1 and the ASME B&PV Code Section III, the subcomponents of pressure retaining components as shown above are not pressure-retaining parts. Therefore, these subcomponents are not relied on to form a pressure-retaining function and are not subject to 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, including pressure boundary sealants, compressible joints and seals, seismic joint filler, and waterproofing membranes are included 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 JAFNPP complies with the applicable safety standards (e.g., Branch Technical Position BTP-APCSB 9.5.1, NFPA-10 for fire extinguishers, NFPA-1962 for fire hoses, 29 CFR 1910.134 for air packs), 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 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 (Reference 2.1-5), the NRC has encouraged applicants for license renewal to address proposed ISGs in the LRA. The NRC staff has identified several issues for which additional staff and industry guidance clarification may be necessary. However, with the exception of ISGs 19B, 23, and 2006-01, these ISGs have been closed (References 2.1-3, 2.1-6, 2.1-7). Where necessary, additional guidance has been incorporated into revised NRC license renewal guidance documents.

ISG-19B, "Proposed Aging Management Program XI.M11-B, 'Nickel-alloy Base-metal Components and Welds in the Reactor Coolant Pressure Boundary,' for License Renewal," is applicable only to PWRs and therefore is not applicable to JAFNPP.

The remaining ISGs are discussed below.

ISG-23 *Replacement Parts Necessary to Meet 10 CFR 50.48 (Fire Protection)*

At JAFNPP a review for replacement parts necessary to meet 10 CFR 50.48 identified temporary ventilation equipment for the station battery and north safety-related pump rooms that is required to be installed following a fire. This equipment is included as part of the heating, ventilation and air conditions systems in Section 2.3.3.7.

ISG-2006-01 *Corrosion of the Mark I Steel Containment Drywell Shell*

The JAFNPP drywell steel shell and the moisture barrier where the drywell shell becomes embedded in the drywell concrete floor are inspected in accordance with the Containment Inservice Inspection (CII) IWE Program and Structures Monitoring Program. The exterior surface of the drywell shell at the sand cushion is effectively drained and protected from condensation or water that might enter the air gap from above and potentially cause corrosion. Therefore, significant corrosion of the JAF drywell is not expected. See Table 3.5.1, Item 3.5.1-5.

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 (Reference 2.1-4), the following GSIs are addressed in this application.

GSI 168 *Environmental Qualification of Electrical Equipment*

This GSI was resolved with no new requirements for licensees (Reference 2.1-8). The staff concluded the existing equipment qualification process was adequate to ensure that I&C cables would perform their intended function. Environmental qualification evaluations of electrical equipment are identified as time-limited aging analyses for JAFNPP and addressed in Section 4.4.

GSI 190 Fatigue Evaluation of Metal Components for 60-Year Plant Life

This GSI addresses fatigue life of metal components and was closed by the NRC (Reference 2.1-9). In the closure letter, however, the NRC concluded that licensees should address the effects of reactor coolant environment on component fatigue life as aging management programs are formulated in support of license renewal. Accordingly, the issue of environmental effects on component fatigue life is addressed in Section 4.3.3.

2.1.5 Conclusion

The methods described in Sections 2.1.1 and 2.1.2 were used at JAFNPP to identify the systems, structures, and components 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*, September 2005.

2.1-3 U.S. NRC, Regulatory Guide 1.188, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses," Revision 1, September 2005.

2.1-4 U.S. Nuclear Regulatory Commission, NUREG-0933, *A Prioritization of Generic Safety Issues*, Supplement 29, November 2005.

2.1-5 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.

2.1-6 Kuo, P. T. (NRC) to A. Marion (NEI) and D. Lochbaum (Union of Concerned Scientists), "Status of Interim Staff Guidance Associated with License Renewal," letter dated May 19, 2005.

2.1-7 Kuo, P. T. (NRC) to A. Marion (NEI) and D. Lochbaum (Union of Concerned Scientists), "Staff Resolution Associated with Interim Staff Guidance ISG-07 Proposed Staff Guidance on the Scoping of Fire Protection Equipment for License Renewal," letter dated June 7, 2005.

2.1-8 Borchardt, R., to W. Travers, "Closeout of Generic Safety Issue (GSI) 168, 'Environmental Qualification of Low-Voltage Instrumentation and Control Cables,'" memorandum dated August 14, 2003.

2.1-9 Thadani, A., Director, Office of Nuclear Regulatory Research, to W. Travers, Executive Director of Operations, "Closeout of Generic Safety Issue 190, 'Fatigue Evaluation of Metal Components for 60 Year Plant Life,'" NRC memorandum dated December 26, 1999.

2.1-10 U.S. Nuclear Regulatory Commission, Regulatory Guide 1.155, "Station Blackout," August 1988.

2.2 PLANT LEVEL SCOPING RESULTS

Tables 2.2-1a, 2.2-1b, and 2.2-3 list the mechanical systems, electrical and instrumentation and controls systems, and structures, respectively, that are within the scope of license renewal for JAFNPP. For mechanical systems, a reference is given to the section which describes the system. For electrical systems, no description is necessary since electrical systems are in scope by default (see Section 2.5). 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 Updated Final Safety Analysis Report (UFSAR) that describes the system or structure. For structures with no description in the UFSAR, 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 JAFNPP 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 2.2-1a. As needed, system components are grouped functionally for the aging management review. For example, ASME Class 1 components in various systems (e.g., the standby liquid control system) are evaluated with the ASME Class 1 reactor coolant system in Section 3.1.2.1.3, and containment penetrations from various systems are grouped into one containment penetrations review in Section 3.2.2.1.7. For each system, see the discussion under "Components Subject to Aging Management Review" for 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 in an (a)(2) aging management review (AMR). The (a)(2) AMR includes nonsafety-related components with the potential for a spatial interaction with a safety-related system 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 list of plant structures was developed from a review of plant layout drawings, the UFSAR (particularly Section 12), and maintenance rule documentation. 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.

Components subject to aging management review are highlighted on license renewal drawings, with the exception of components in scope for 10 CFR 54.4(a)(2) for a physical interaction with safety-related equipment. The drawings are flagged as needed to indicate system intended function boundaries. For further discussion of license renewal drawings, see Section 2.1.2.1.3.

Table 2.2-1a
Mechanical Systems within the Scope of License Renewal

System Number	System Name	LRA Section Describing System
01	Gas Handling	Section 2.3.2.6, Gas Handling (Including Standby Gas Treatment)
02	Reactor Coolant	Section 2.3.1, Reactor Coolant System
02-ADS	Automatic Depressurization System	Section 2.3.2.3, Automatic Depressurization
03	Control Rod Drive	Section 2.3.1, Reactor Coolant System
07	Neutron Monitoring (TIP)	Section 2.3.1, Reactor Coolant System
10	Residual Heat Removal	Section 2.3.2.1, Residual Heat Removal
11	Standby Liquid Control	Section 2.3.3.1, Standby Liquid Control
12	Reactor Water Cleanup	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
13	Reactor Core Isolation Cooling	Section 2.3.2.5, Reactor Core Isolation Cooling
14	Core Spray	Section 2.3.2.2, Core Spray System
15	Reactor Building Closed Loop Cooling Water	Section 2.3.3.11, Reactor Building Closed Loop Cooling Water
16	Primary Containment	Section 2.3.2.7, Primary Containment Penetrations
17	Process Radiation Monitors	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
19	Fuel Pool Cooling and Cleanup	Section 2.3.3.9, Fuel Pool Cooling and Cleanup
20	Radwaste	Section 2.3.3.12, Radwaste and Plant Drains
23	High Pressure Coolant Injection	Section 2.3.2.4, High Pressure Coolant Injection
27	Containment Purge/CAD/PASS	Section 2.3.3.8, Containment Purge, Containment Atmosphere Dilution, and Post-Accident Sampling

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

System Number	System Name	LRA Section Describing System
29	Main Steam	Section 2.3.4.2, Main Steam
31	Extraction Steam	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
32	Decay Heat Removal	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
33	Condensate	Section 2.3.4.1, Condensatee
34	Feedwater	Section 2.3.4.3, Feedwater
35	FW Heater Vents and Drains	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
36	Circulating Water	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
37	Turbine Building Closed Loop Cooling	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
38	Vacuum Priming and Air Removal	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
39	Service, Instrument, and Breathing Air	Section 2.3.3.10, Service, Instrument, and Breathing Air
40	Turbine Lube Oil	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
41	Secondary Plant Drains	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
42	Raw Water Treatment	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
44	Contaminated Equipment Drains	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
46	Service Water	Section 2.3.3.2, Service Water
63	Auxiliary Gas Treatment	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)

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

System Number	System Name	LRA Section Describing System
66	Reactor Building Ventilation	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
67	Turbine Building Ventilation	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
68	Drywell Ventilation and Cooling	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
69	Radwaste Building Ventilation and Cooling	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
70	Control / Relay Room Ventilation and Cooling	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
72	Administration Building Ventilation and Cooling	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
73	Screenwell / Water Treatment Ventilation and Cooling	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
74	Plumbing, Sanitary and Lab	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
75	Floor and Roof Drainage	Section 2.3.3.12, Radwaste and Plant Drains
76	Fire Protection	Section 2.3.3.5, Fire Protection – Water Section 2.3.3.6, Fire Protection – CO2
77	Yard Storm Drains	Section 2.3.3.12, Radwaste and Plant Drains
78	City Water	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
87	Auxiliary Boiler and Accessories	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
92	EDG Building Heating, Ventilation and Air Conditioning	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
93	Emergency Diesel Generator	Section 2.3.3.3, Emergency Diesel Generator

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

System Number	System Name	LRA Section Describing System
94	Main Turbine Generator	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
95	Sample System	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
96	Steam Seal	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
99	Security	Section 2.3.3.13, Security Generatorr

Because of the bounding approach used for scoping electrical and I&C equipment, all electrical and I&C commodities contained in electrical and mechanical systems are in scope by default. Table 2.2-1b provides the list of electrical and I&C systems that do not include mechanical components that meet the scoping criteria of 10 CFR 54.4. Systems with mechanical components that meet the scoping criteria of 10 CFR 54.4 are listed in Table 2.2-1a. Descriptions of each electrical system are not provided. UFSAR Chapters 7 and 8 describe most I&C and electrical systems (steam leak detection is described in Section 4.10.3.4). For further information, see Section 2.5, Scoping and Screening Results: Electrical and Instrumentation and Controls Systems.

Table 2.2-1b
Electrical and I&C Systems within the Scope of License Renewal (Bounding Approach)

System Number	System Name
00-0000	Miscellaneous
02-0000	Nuclear Boiler[1]
02-SLKD	Steam Leak Detection
05	Reactor Protection System
06	Feedwater Flow Control
07-0000	Neutron Monitoring
07-APRM	Average Power Range Monitors (Including Flow Units, Rod Block Monitors, local power range monitors (LPRM) Groups and LPRM Detectors)
07-IRM0	Intermediate Range Monitors
07-SRM0	Source Range Monitors
09	Control Room Equipment
09-0040	Process Computer Equipment
18	Area Radiation Monitors
22	Site Environment Radiation Monitors
25	Local Panels & Racks
47	Plant Support Computer Systems

Table 2.2-1b
Electrical and I&C Systems within the Scope of License Renewal (Bounding Approach) (Continued)

System Number	System Name
71-0000	Electrical
71-ESSD	Emergency Station Service Distribution
71-NSSD	Normal Station Service Distribution
71-SDCD	Station DC Distribution
71-SWYD	Switchyard
System Code	**UFSAR System Name**[2]
03-0000	Reactor Manual Control System
08	Refueling Interlocks
16-0000	Reactor Vessel Isolation Control Systems
17	Dose Assessment Computer System
66-0000	Reactor Building Isolation And Control System
93	Emergency AC Power System
94	Pressure Regulator And Turbine Control System

1. The nuclear boiler system, as defined by the equipment database, consists of miscellaneous reactor coolant system electrical components, primarily instruments and controls.

2. The UFSAR describes the following instrumentation, control and electrical systems using these system names. These systems are encompassed by other systems (with the indicated system codes) with mechanical components that are listed in either Table 2.2-1a or Table 2.2-2. The systems listed here are those that are prominently mentioned in the UFSAR but may not be clearly part of the mechanical system.

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

System Number	System	UFSAR Reference
08	Refueling/Servicing Equipment and Tools	Sections 7.6, 9.17.6
26	Stack and Stack Equipment	Sections 5.3, 11.4.4.2
65	Gatehouse (contains HVAC equipment)	None
89	Hydrogen Addition	Section 9.20
97	Sewage Treatment Facility	Section 9.12 (Section 9.12 refers to the sanitary waste disposal system, which is part of the sewage treatment facility)

Table 2.2-3
Structures within the Scope of License Renewal

Structure Name	LRA Section
Administration Building (including Control Room)	Section 2.4.3, Turbine Building Complex and Yard Structures
Circulating Water Discharge Tunnel	Section 2.4.2, Water Control Structures
Circulating Water Intake Tunnel	Section 2.4.2, Water Control Structures
Condensate Storage Tanks Foundation and Shield Wall	Section 2.4.3, Turbine Building Complex and Yard Structures
Electric Bays (including East and West Cable Tunnels)	Section 2.4.3, Turbine Building Complex and Yard Structures
Emergency Diesel Generator Building	Section 2.4.3, Turbine Building Complex and Yard Structures
Intake Structure	Section 2.4.2, Water Control Structures
Main Stack	Section 2.4.3, Turbine Building Complex and Yard Structures
Manholes and Duct Banks	Section 2.4.3, Turbine Building Complex and Yard Structures
Nitrogen Storage Building (CAD)	Section 2.4.3, Turbine Building Complex and Yard Structures
Primary Containment	Section 2.4.1, Reactor Building and Primary Containment
Radioactive Waste Building	Section 2.4.3, Turbine Building Complex and Yard Structures
Reactor Building	Section 2.4.1, Reactor Building and Primary Containment
Reactor Track Bay (or Railroad and Truck Port Building)	Section 2.4.1, Reactor Building and Primary Containment
Screenwell – Pumphouse	Section 2.4.2, Water Control Structures
Security Building	Section 2.4.3, Turbine Building Complex and Yard Structures

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

Structure Name	LRA Section
Standby Gas Treatment Building	Section 2.4.3, Turbine Building Complex and Yard Structures
Transformer/Switchyard Support Structures and Foundations	Section 2.4.3, Turbine Building Complex and Yard Structures
Transmission Towers and Foundations	Section 2.4.3, Turbine Building Complex and Yard Structures
Turbine Building (including Heater Bay)	Section 2.4.3, Turbine Building Complex and Yard Structures

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

Structure Name	UFSAR Reference or Function
Administration and Support Facility	UFSAR Section 12.3.11
Archival Storage Building	UFSAR Section 12.3.12
Auxiliary Boiler Building	UFSAR Section 12.3.8
Building and Grounds Garage and Building and Grounds Garage Storage	Houses equipment used to maintain the site buildings and grounds
Chlorination Building	Houses retired Sewage Treatment System chlorination equipment.
Contract Services Buildings (East and West)	House contract services personnel and their equipment
Duplex Sewage Pump Building	Used as a transfer station to the new sewage treatment plant
Fab Shop	Provides additional space for equipment fabrication
Fuel Oil Tank Foundation	Provides support for the auxiliary boiler fuel oil storage tank
Gas Bottle Storage	Supports and protects bottles of various gases
Gate Building	Used for safety shoe storage and distribution (formerly used for site access)
Hydrogen Storage Facility Foundation	UFSAR Section 9.20.3.1
Interim Waste Storage Facility	UFSAR Section 12.3.10
Main Security Building	Provides access control of personnel and vehicles to the site protected area
O_2 Storage Tank Foundation	Provides support for the oxygen storage tank
Sewage Treatment Plant	UFSAR Section 9.12.3
Training Center	Provides space and facilities for the training of plant and contractor personnel

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

Structure Name	UFSAR Reference or Function
Transformer Building (or Transformer Shed)	Supplies power, in part, to the administration and support building chemistry lab and respirator cleaning building and out buildings. No safety-related systems or systems required for any of the regulated events are supplied by this building.
Warehouse No. 1 and 2	UFSAR Section 12.3.12
Waste Surge Tank (TK-18) Foundation	Provides support to the waste surge tank
Wellness Center	Provides physical fitness facilities for plant personnel

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

2.3.1 Reactor Coolant System

System Description

The reactor coolant system (RCS), also called the nuclear boiler system, includes mechanical components in the following subsystems.

- reactor vessel
- reactor vessel internals
- reactor water recirculation
- reactor vessel instrumentation
- recirculation flow control
- control rod drive
- neutron monitoring

Reactor Vessel System

The reactor vessel and vessel internals together make up the reactor vessel system.

Reactor Vessel

The purpose of the reactor vessel 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 includes 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 and penetrations are provided in the vessel shell and top and bottom heads. These include reactor water recirculation inlets and outlets, feedwater inlets and main steam outlets, core spray inlets, control rod drives, head vent, vessel drain, and instrumentation connections.

There are multiple attachments to the reactor pressure vessel for supporting various internal components. These internal attachments include shroud support pad, jet pump riser support pads, steam dryer support brackets, feedwater sparger brackets, core spray brackets, surveillance specimen holder brackets and others.

There are multiple external attachments to the reactor pressure vessel. The external attachments include head lifting lugs, insulation support and support brackets, thermocouple pads, stabilizer brackets, and a support skirt.

The reactor vessel is supported by a steel support skirt. The skirt is integral with the bottom of the vessel shell. The skirt rests on a ring girder support positioned on a reinforced concrete pedestal that is integral with the primary containment foundation. Vessel stabilizers are provided to transmit seismic and jet reaction forces from the reactor vessel to the top of the primary shield wall surrounding the vessel.

Reactor Vessel Internals

The purpose of the reactor vessel internals is to properly distribute the flow of coolant delivered to the vessel, to locate and support the fuel assemblies, and to provide an inner volume containing the core that can be flooded following a break in the nuclear system process barrier external to the reactor pressure vessel. The reactor vessel internals include the core structure, shroud support assembly, control rod guide tubes, fuel support pieces, incore flux monitor guide tubes, steam dryer, guide rods, jet pump assemblies and jet pump instrumentation, core spray distribution lines, the differential pressure and liquid control line, surveillance sample holders, and feedwater spargers.

The core structure surrounds the active core of the reactor and consists of the core shroud, shroud head and steam separator assembly, core support, and top guide. This structure is used to form partitions within the reactor pressure vessel, to sustain pressure differentials across the partitions, to direct the flow of the coolant water, and to locate laterally and support the fuel assembles, control rod guide tubes and steam separators.

The shroud support assembly, welded to the inside diameter of the vessel shell in the lower plenum, provides the support for the shroud and core structure.

The control rod guide tubes extend from the top of the control rod drive housings up through holes in the core support. Each control rod guide tube is designed as the lateral guide for a control rod and as the vertical support for a four-lobed fuel support piece and the four fuel assemblies surrounding the control rod. The fuel support pieces are either peripheral or four-lobed. The peripheral fuel support pieces are welded to the core support assembly at the outer edge of the active core. The four-lobed fuel support pieces rest in the top of the control rod guide tubes.

The incore flux monitor guide tubes extend from the top of the incore flux monitor housings, in the lower plenum, to the top guide. The power range detectors for the power range monitoring units and the dry tubes for the source range monitoring and intermediate range monitoring (SRM/IRM) detectors are inserted through the guide tubes.

The steam dryer and shroud head are positioned in the vessel with the aid of the guide rods. The dryer assembly rests above the shroud head on steam dryer support brackets attached to the reactor vessel wall.

The jet pump assemblies are located in two semicircular groups in the downcomer annulus between the core shroud and the reactor vessel wall. Each stainless steel jet pump consists of a driving nozzle, suction inlet, throat or mixing section, and diffuser. Jet pump instrumentation internal to the vessel consists of tubing and brackets.

Core spray distribution inside the vessel is provided by lines from the two reactor vessel core spray nozzles to two sets of semicircular headers inside of the upper shroud. Spray is directed by a combination of distribution nozzles pointed radially inward and downward from the headers.

The differential pressure and liquid control line enters the reactor vessel as two concentric pipes. In the lower plenum, the two pipes separate. The inner pipe, used to sense the pressure below the core support and to inject liquid control solution[1], terminates near the lower shroud. The outer pipe terminates immediately above the core support and senses the pressure in the region outside the fuel assembly channels.

The feedwater spargers are perforated stainless steel headers located in the mixing plenum above the downcomer annulus. A separate sparger is fitted into each feedwater nozzle and is shaped to conform to the curve of the vessel wall.

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

- Maintain reactor coolant pressure boundary.
- Maintain reactor core geometry
    - to 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;
    - to ensure that the control rods and ECCS can perform their safety functions;
    - to ensure that the safe shutdown of the plant and removal of decay heat are not impaired.

1. The differential pressure and liquid control line piping internal to the vessel does not have an intended function related to injection of SLC. Only the piping up to the vessel is required to support this function, and this piping is covered by the inclusion of SLC system Class I components in the review of the reactor coolant pressure boundary (Section 2.3.1.3).

The reactor vessel system (vessel and internals) has the following intended functions 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 vessel system has no intended functions for 10 CFR 54.4(a)(3).

Reactor Water Recirculation

The purpose of the reactor water recirculation system is to provide a variable moderator (coolant) flow to the reactor core for adjusting reactor power level.

The reactor water recirculation system consists of two recirculation loops external to the reactor vessel which provide the piping path for the driving flow of water to the reactor vessel jet pumps. Each external loop contains one variable speed, motor-driven recirculation pump and two motor-operated gate valves which are provided to facilitate pump maintenance. Each pump discharge line contains a venturi-type flow element which provides a coolant flow input signal for the reactor protection system. Each of the two external recirculation loops discharge high pressure flow into an external manifold from which individual recirculation inlet lines are routed to the jet pump risers within the reactor vessel.

The recirculation loops are a part of the reactor coolant pressure boundary and are located inside the primary containment structure. The loops provide flow paths for low pressure coolant injection (LPCI) injection into the vessel and for shutdown cooling. The reactor water recirculation system also provides a flowpath to the sampling system and includes unused primary containment piping penetrations.

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

- Maintain reactor coolant pressure boundary.
- Act as a primary radioactive material barrier.
- Provide flow paths for LPCI injection into the vessel and for shutdown cooling.
- Support primary containment isolation.
- Maintain pressure boundary for instrument N2/air supply in primary containment (function performed by 02-2SOV-39).

The reactor water recirculation system has the following intended function for (a)(2):

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

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

Reactor Vessel Instrumentation

The purpose of reactor vessel instrumentation is to monitor reactor vessel parameter information to ensure sufficient control of the key parameters to facilitate safe operation of the plant. Measurements of temperature, pressure, differential pressure, flow, level and core power are transmitted to protective systems, control systems and to the reactor control room for operator information. Mechanical portions of the system support the measurement of hydraulic parameters. Piping from the reactor vessel and recirculation system passes outside primary containment to the reactor building where most sensors are located. The reactor vessel instrumentation system also includes unused primary containment piping penetrations.

Reactor vessel instrumentation has the following intended function for 10 CFR 54.4(a)(1).

- Maintain reactor coolant pressure boundary (function performed by mechanical components of the reactor vessel instrumentation system).
- Support primary containment isolation.

Reactor vessel instrumentation 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.

Reactor vessel instrumentation has no intended functions for 10 CFR 54.4(a)(3).

Recirculation Flow Control

The purpose of the recirculation flow control system is to control the speed of the two reactor water recirculation pumps by varying the electrical frequency of the power supply for the pumps. A variable frequency, AC motor-generator set located outside the drywell supplies power to each recirculation pump motor. The pump motor is electrically connected to the generator and is started by engaging the variable speed coupling between the generator and its drive motor. By varying the coolant flow rate through the core, power level may be changed. The system is arranged to allow manual control room operator action. The rotating inertia of the motor-generator set supports a slow coastdown of flow following some transients; however, the recirculation flow control system is not credited in any of the design basis events.

The recirculation flow control system has no intended functions for 10 CFR 54.4(a)(1) or (a)(3).

The recirculation flow control 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.

Control Rod Drive

The purpose of the control rod drive (CRD) system is to provide reactivity control by positioning the control rods to control power generation in the core. When required, the control rod drive system is designed to insert the control rods with sufficient speed to limit fuel barrier damage. The control rod drive system includes the control rod blades, the control rod drive mechanisms, and the components, piping and valves of the control rod drive hydraulic system.

The CRD mechanism used for positioning the control rod in the reactor core is a double-acting, mechanically latched, hydraulic cylinder using processed condensate as its operating fluid. The individual drives are mounted on the bottom head of the reactor vessel. The control rod drive hydraulic system hydraulically operates the CRD mechanisms using processed condensate water as hydraulic fluid. The CRD mechanisms operate manually to position the control rods but act automatically to rapidly insert the control rods during abnormal conditions requiring rapid shutdown.

The control rod drive hydraulic system supplies and controls the pressure and flow to and from the drives. One supply subsystem supplies water to the hydraulic control units (HCU) at the correct flow. Each HCU controls the flow to and from a drive. 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 is distributed by reverse flow to all the CRDs through the insert-exhaust directional control solenoid valves.

Should the reactor protection system fail to scram the reactor, an alternate rod injection (ARI) system would actuate. The ARI system provides an alternate means of scramming the reactor using the existing CRD system.

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

- Provide a means to quickly terminate the nuclear fission process in the core so that damage to the fuel barrier is limited.
- Maintain integrity of reactor coolant pressure boundary.
- Support primary containment isolation.
- Limit withdrawal velocity of control rods and prevent spurious withdrawal of control rods.

The control rod drive 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.

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

- Provide Alternate Rod Insertion for a diverse, independent means to automatically shutdown the reactor for ATWS.
- The CRD system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

Neutron Monitoring

The neutron monitoring system, which is primarily an instrumentation system with no mechanical components, includes mechanical components in the traversing incore probe (TIP) subsystem.

The purpose of the TIP subsystem is to provide a signal proportional to the neutron flux, at any axial location wherever power range detector assemblies are located. Each TIP channel (or subsystem) uses a gamma detector attached to a titanium-sheathed signal and drive cable, which is driven from outside the primary containment by a drive mechanism. The flexible cable is contained by guide tubes that continue into the reactor core. The guide tubes are a part of the power range detector assembly. The TIP subsystem includes QA I primary containment isolation valve assemblies on each guide tube entering the primary containment. These valves are closed except when the TIP subsystem is in operation, or to support system testing or maintenance activities. Each isolation valve assembly consists of a ball valve that closes when the TIP probe is withdrawn and a cable shearing valve that can shear off the probe if containment isolation is required. The valves are part of the containment boundary. Otherwise, this is an instrumentation system.

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

- Provide isolation of the traversing in-core probe guide tubes based on manual initiation.

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

UFSAR References

Reactor vessel - Sections 3.3, 4.2, 4.2.5
Reactor water recirculation - Section 4.3
Reactor vessel instrumentation - Section 7.8
Recirculation flow control - Section 7.9

Control rod drive - Section 3.5
Neutron monitoring (TIP) - Section 7.5.9

Components Subject to Aging Management Review

The RCS Class I piping evaluation boundary extends into portions of systems attached to the RCS. The Class I components of the systems listed below are included in the RCS aging management review. The non-Class 1 portions of the systems listed below are reviewed as referenced.

- residual heat removal system (Section 2.3.2.1)
- core spray system (Section 2.3.2.2)
- automatic depressurization system (Section 2.3.2.3)
- high pressure coolant injection system (Section 2.3.2.4)
- reactor core isolation cooling system (Section 2.3.2.5)
- standby liquid control system (Section 2.3.3.1)
- main steam (Section 2.3.4.2)
- feedwater system (Section 2.3.4.3)
- reactor water cleanup (Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2))

The following non-Class I RCS components are evaluated with other aging management reviews.

- Components of the control rod drive and hydraulic control units (HCU) systems with an instrument air system interface and the valve (02-2SOV-39) that forms part of the instrument N2/air supply pressure boundary in primary containment are evaluated with the instrument air system (Section 2.3.3.10).
- The neutron monitoring TIP system isolation valves and containment isolation components of the reactor vessel instrumentation system are evaluated with primary containment penetrations (Section 2.3.2.7).
- Nonsafety-related components of the reactor water recirculation, reactor vessel instrumentation, recirculation flow control, and control rod drive systems that have the potential to adversely affect safety-related systems or components (10 CFR 54.4(a)(2)) are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14).

The control rod drive mechanisms are active components and therefore not subject to aging management review. The control rod blades are not subject to aging management review as they are periodically replaced on the basis of exposure and are therefore not long-lived components.

Fuel assemblies are not subject to aging management review because they are replaced after a limited number of cycles and are therefore not long-lived components.

JAFNPP does not have an isolation condenser.

Aging management review of the remaining RCS components is covered by three separate reviews:

- reactor vessel (Section 2.3.1.1),
- reactor vessel internals (Section 2.3.1.2), and
- reactor coolant pressure boundary (RCPB) (Section 2.3.1.3).

Tables 2.3.1-1, 2.3.1-2, and 2.3.1-3 list the components that require aging management review and their intended functions.

Tables 3.1.2-1, 3.1.2-2, and 3.1.2-3 provide the results of the aging management review for RCS components and components evaluated with the RCS.

License Renewal Drawings

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

LRA-FM-18C	LRA-FM-24A	LRA-FM-29A
LRA-FM-20A	LRA-FM-25A	LRA-FM-34A
LRA-FM-21A	LRA-FM-26A	LRA-FM-47A
LRA-FM-22A	LRA-FM-27A	
LRA-FM-23A	LRA-FM-27B	

2.3.1.1 Reactor Vessel

The reactor vessel contains the nuclear fuel core, core support structures, control rods, and other parts directly associated with the reactor core.

The major components of the reactor vessel include the reactor vessel shell, lower head, upper closure head, flanges, studs, nuts, nozzles and safe ends. The component evaluation boundaries for this review are the welds between the safe ends and attached piping or at the interface flange for bolted connections. Thermal sleeves that are welded to vessel nozzles or safe ends are included as are control rod drive stub tubes, control rod drive housings, and incore monitor housings. The vessel support skirt, vessel interior welded attachments, and vessel exterior attachments are also included.

Table 2.3.1-1 lists the mechanical components subject to aging management review and component intended functions for the reactor vessel and pressure boundary subcomponents of the control rod drive mechanisms.

Table 3.1.2-1 provides the results of the aging management review for reactor vessel and pressure boundary subcomponents of the control rod drive mechanisms.

2.3.1.2 Reactor Vessel Internals

The reactor vessel internals are installed inside the reactor pressure vessel to properly distribute the flow of coolant delivered to the vessel, to locate and support the fuel assemblies, and to provide an inner volume containing the core that can be flooded following a break in the nuclear system process barrier external to the reactor pressure vessel.

The reactor vessel internals include the following subcomponents.

- control rod guide tubes and thermal sleeves
- core spray lines
- core support (core plate)
- differential pressure and standby liquid control line
- feedwater spargers
- fuel support pieces
- guide rods
- incore flux monitor guide tubes, dry tubes, and local power range monitors (LPRMs)
- jet pump assemblies
- jet pump instrumentation
- shroud (including shroud stabilizers)
- shroud head and steam separator assembly
- shroud support
- steam dryers
- surveillance capsule holders
- top guide assembly
- vessel head spray

The core structure surrounds the active core of the reactor and consists of the core shroud, shroud head and steam separator assembly, core support, and top guide. This structure forms partitions within the reactor pressure vessel, sustains pressure differentials across the partitions, directs the flow of the coolant water, and locates laterally and supports the fuel assembles, control rod guide tubes and steam separators.

The reactor vessel internals items that are subject to aging management review include the control rod guide tubes and thermal sleeves, core shroud including shroud stabilizers, core spray lines in the vessel, core support, fuel support pieces, incore flux monitor guide tubes, incore dry tubes, LPRMs, jet pump assemblies, shroud support, steam dryers, and top guide assembly.

The reactor vessel internals items that are not subject to aging management review are the differential pressure and standby liquid control (ΔP/SLC) line inside the vessel, feedwater spargers, guide rods, jet pump instrumentation inside the vessel, shroud head and steam separator assembly, surveillance capsule holders, and vessel head spray subcomponents.

Table 2.3.1-2 lists the mechanical components subject to aging management review and component intended functions for the reactor vessel internals.

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

2.3.1.3 Reactor Coolant Pressure Boundary

The following systems, in whole or in part, comprise the reactor coolant system pressure boundary.

- Control rod drive
- Core spray system
- Feedwater
- High pressure coolant injection system
- Main steam
- Nuclear boiler vessel instruments
- Reactor core isolation cooling system
- Reactor water recirculation
- Reactor water cleanup system
- Residual heat removal system
- Standby liquid control system

Class 1 piping attached to the vessel nozzles or safe ends, including the welded joints, Class 1 pumps, and Class 1 boundary isolation valves are included in this review. Connected Class 2 piping that is not part of another aging management review is reviewed as far as needed to complete the RCS pressure boundary. This includes vents, drains, leakoff, sample lines, and instrumentation lines up to the transmitters. The evaluation boundaries of the RCPB extend to any or all of the following.

- Outboard containment isolation valves on system piping which penetrates primary reactor containment, consistent with the Class 1 boundary.
- The first normally closed isolation valve for piping which does not penetrate the containment. For instrumentation that does not have a normally closed isolation valve, the boundary extends to the instrument housing.
- Reactor coolant system safety/relief valves (SRVs) up to the valve seat, i.e. normally pressurized components.
- Instrumentation root valves and associated instrumentation lines up to the instruments.

Table 2.3.1-3 lists the mechanical components subject to aging management review and component intended functions for the RCPB.

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

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

Component Type	Intended Function
Attachments and Supports	
Reactor vessel external attachments • Stabilizer brackets • Support skirt	Support for Criterion (a)(1) equipment
Reactor vessel internal attachments and welds • Core spray brackets • *Feedwater sparger brackets* • Guide rod brackets • Jet pump riser pads • Shroud support pad • Surveillance specimen holder brackets • Feedwater sparger brackets	Support for Criterion (a)(1) equipment
Reactor vessel internal attachments and welds • Dryer holddown brackets • Dryer support brackets	Support for Criterion (a)(1) equipment
Bolting	
Incore monitor housing bolting • Flange bolts • Closure flanges • Nuts and washers CRD flange capscrews and washers	Pressure boundary
Other bolting • *Flange bolts*	Pressure boundary
Reactor vessel closure flanges • Closure studs, nuts, washers and bushings	Pressure boundary
Nozzles and Penetrations	
CRD housings	Pressure boundary

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

Component Type	Intended Function
CRD stub tubes	Pressure boundary
Incore monitor housings	Pressure boundary
Nozzles • Core spray • Jet pump instrument • Recirc outlet • Core ΔP / SLC • CRD return • Drain • Feedwater • Flange leakoff • Main steam • Recirc inlet • Head vent • Spare • Instrumentation	Pressure boundary
Safe Ends, Thermal Sleeves, Caps and Flanges	
CRD return line cap	Pressure boundary
Nozzle flanges • Blank flanges • Nozzle flanges	Pressure boundary
Nozzle safe ends ≥ 4" • Core spray • Jet pump instrument • Recirc inlet/outlet • Feedwater • Main steam	Pressure boundary
Nozzle safe ends < 4" • Core ΔP / SLC • Instrumentation	Pressure boundary
SLC nozzle to safe end weld	Pressure boundary

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

Component Type	Intended Function
Thermal sleeves • Core spray • Feedwater inlet • Recirc inlet	Pressure boundary
Shell and Heads	
Reactor vessel bottom head	Pressure boundary
Reactor vessel shell • Closure flange • Lower shell and lower intermediate beltline shell (6 plates) and connecting welds • Upper intermediate and upper shell	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 • Tubes • CRD thermal sleeves • Bases	Support for Criterion (a)(1) equipment
Core spray lines • Brackets, piping, spargers, t-boxes, t-box and upper elbow gussets • Downcomer repair clamshell sleeve • U-bolt and clamp bolts	Flow distribution
Core support • Alignment pins, bar, eyebolt, pipe, plates	Support for Criterion (a)(1) equipment
Core support rim bolts	Support for Criterion (a)(1) equipment
Fuel support pieces • Orificed supports • Peripheral supports	Support for Criterion (a)(1) equipment
Incore flux monitors • Dry tubes • LPRM • Guide tubes	Pressure boundary
Jet pump assemblies • Riser pipe, riser elbow, riser braces • Hold down bolts • Mixer barrels • Restrainer bracket wedge assemblies • Diffuser shell, tailpipes and adapter (top piece) • Holddown beams • Diffuser adapter (bottom piece)	Floodable volume

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

Component Type	Intended Function
Jet pump castings • Transition piece • Inlet elbow/ nozzle • Mixer adapter • Restrainer bracket • Diffuser collar	Floodable volume
Shroud • Upper, central, and lower sections, and bolting	Support for Criterion (a)(1) equipment Floodable volume
Shroud stabilizers • Radial restraints • Tie rod assemblies • Brackets	Support for Criterion (a)(1) equipment
Shroud support • Ring, cylinder, gussets and manway covers	Support for Criterion (a)(1) equipment Floodable volume
Steam dryers	Structural integrity
Top guide assembly	Support for Criterion (a)(1) equipment

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

Component Type	Intended Function
Bolting	Pressure boundary
Condensing chambers	Pressure boundary
Drive (CRD)	Pressure boundary
Driver mount (RWR)	Pressure boundary
Filter housing (CRD)	Pressure boundary
Flow elements (RWR)	Pressure boundary
Orifices (Instrumentation)	Pressure boundary
Piping and fittings < 4" NPS	Pressure boundary
Piping and fittings ≥ 4" NPS	Pressure boundary
Pump casing and cover (RWR)	Pressure boundary
Pump cover thermal barrier (RWR)	Pressure boundary
Restrictors (MS)	Flow control
Rupture disc (CRD)	Pressure boundary
Tank (CRD accumulator)	Pressure boundary
Tank (CRD scram discharge volume)	Pressure boundary
Thermal sleeves (FW)	Pressure boundary
Thermowells < 4" NPS (NBVI, RWR)	Pressure boundary
Tubing	Pressure boundary
Valve bodies < 4" NPS	Pressure boundary
Valve bodies ≥ 4" NPS	Pressure boundary

2.3.2 Engineered Safety Features

The engineered safety features are described in UFSAR Sections 5 and 6.

The following systems are described in this section.

- residual heat removal
- core spray system
- automatic depressurization
- high pressure coolant injection
- reactor core isolation cooling
- gas handling (including standby gas treatment)
- primary containment penetrations

2.3.2.1 Residual Heat Removal

System Description

This system includes both the residual heat removal and residual heat removal service water systems.

The purpose of the residual heat removal (RHR) system is to restore and maintain the coolant inventory in the reactor vessel so that the core is adequately cooled after a loss of coolant accident (LOCA) and to provide core cooling during a normal shutdown. The RHR system also provides containment cooling so that condensation of the steam resulting from the blowdown due to the design basis LOCA is ensured.

The purpose of the RHR service water system is to provide a reliable supply of cooling water for residual heat removal under post-accident and shutdown conditions.

The RHR system is a two-loop system containing two heat exchangers with steam condensing capability and four main system pumps. The loops are physically separated from each other. A single header cross connects the two loops, making it possible to supply either loop from the pumps in the other loop. The system discharge piping is kept in a filled condition by its keep-full pumps to minimize time delay in LPCI actuation and to avoid water hammer on pump starts.

The RHR service water system provides cooling water to the RHR heat exchangers. The system consists of two independent loops supplied from four RHR service water pumps located in the screenwell house. The system discharges back to Lake Ontario via the circulating water discharge tunnel.

The RHR system is normally lined up for automatic actuation in the LPCI mode.

The RHR system has the following modes of operation.

Low Pressure Coolant Injection

In the LPCI mode, the RHR system operates to restore and maintain the coolant inventory in the reactor vessel after a LOCA. During LPCI operation, RHR pumps take suction from the suppression chamber and discharge into the reactor vessel core region through both recirculation loops. Flow through the break is contained by the drywell and returned to the suppression chamber via the pressure suppression vent lines. The RHR system operates in conjunction with the automatic depressurization system in this mode.

Containment Spray (Drywell Spray and Torus Spray)

The containment spray mode aids in reducing drywell pressure following a LOCA. The containment spray mode is initiated manually after the LPCI cooling requirements have been satisfied. In the containment spray mode of operation, the RHR pumps transfer water from the suppression chamber through the RHR heat exchangers and the corresponding heat exchanger bypass line, where the RHR service water removes heat. The cool water is diverted to two redundant spray headers to lower drywell and containment pressure.

Steam Condensing

The RHR system in the steam condensing mode may be operated in conjunction with the reactor core isolation cooling (RCIC) system in case of a loss of the main condenser as directed by emergency operating procedures. During reactor isolation, reactor steam may be relieved to the suppression chamber, via the relief valves, where it is condensed and subcooled. Decay heat is transferred to the RHR service water using the RHR heat exchangers as direct steam condensers.

Shutdown Cooling

The shutdown cooling mode is used during normal shutdown and cooldown. The initial phase of reactor coolant system cooldown is accomplished by dumping steam from the reactor vessel to the main condenser with the main condenser acting as the heat sink. Reactor cooldown is then completed by pumping reactor coolant with the RHR pumps from recirculation loop B through the RHR heat exchangers, which transfer heat to RHR service water. The cooled reactor coolant is returned to the reactor vessel via either recirculation loop.

Alternate Shutdown Cooling

The alternate shutdown cooling mode provides a cooling path if the normal shutdown cooling path is inoperable. The RHR pumps take suction from the suppression pool, pass it through the RHR heat exchangers and inject into the vessel via the RHR injection valves. Water overflows into the main steam lines, and SRVs are opened to allow flow to the suppression pool. This mode is also used as a response to the Appendix R events.

Suppression Pool Cooling

The suppression pool cooling mode of RHR takes suction from the suppression pool, passes it through the RHR heat exchangers, and returns flow to the suppression pool. This mode of operation is designed to remove heat from the suppression pool.

Fuel Pool Cooling

The fuel pool cooling mode takes suction from the fuel pool cooling system, flows through the RHR heat exchangers, and discharges back to the fuel pool cooling system. This mode of operation is designed to assist in fuel pool cooling during reactor shutdown periods and alternate cooling system operation and is not a safety function.

RHR Service Water to RHR Cross Tie (Unlimited Make-Up)

The emergency reactor vessel fill mode of RHR provides a cross-tie between the RHR service water system and RHR piping. The RHR service water pumps take suction from the service water system and inject into the reactor vessel through the RHR piping. This mode of operation provides a source of water to maintain the reactor core covered (and fill containment) in the event that emergency core cooling systems pumps are unavailable. This is not a design basis safety function.

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

- Provide low pressure core cooling (LPCI mode) following a design basis accident.
- Maintain integrity of reactor coolant pressure boundary.
- Support primary containment isolation.
- Provide suppression pool cooling.
- Provide containment cooling.
- Provide service water to RHR heat exchangers via RHR service water system.
- Remove decay heat from the reactor core when shut down and depressurized during abnormal operational transients.

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

- Nonsafety-related valves of the RHR system that interface with the fuel pool cooling system support the intended functions of the fuel pool cooling system.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

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

- The RHR system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

<u>UFSAR References</u>

Sections 4.8.1, 4.8.3, 4.8.4, 4.8.5, and 9.7.3

Components Subject to Aging Management Review

Components of the residual heat removal service water system are evaluated with service water systems (Section 2.3.3.2). ASME Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed with the RCS (Section 2.3.1). Valves of the RHR system that support the fuel pool cooling system intended functions are evaluated with the fuel pool cooling and cleanup system (Section 2.3.3.9). Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining RHR components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-FM-15B	LRA-FM-20A
LRA-FM-18C	LRA-FM-20B

2.3.2.2 Core Spray System

System Description

The purpose of the core spray (CS) system is to protect the core by spraying water over the fuel assemblies to remove decay heat following the postulated design basis loss-of-coolant accident (LOCA). As part of the emergency core cooling systems (ECCS), the core spray system maintains core coolant inventory to prevent fuel damage, which limits, in conjunction with the primary and secondary containments, the release of radioactive materials to the environs following a LOCA so that resulting radiation exposures are kept within the guideline values given in 10 CFR 100.

The CS system consists of two redundant pumping loops. Each loop contains a motor-driven centrifugal pump, associated piping, valves, spray spargers, control logic, and associated instrumentation and controls. The pump suction is normally supplied from the suppression pool, but may be lined up to the condensate storage tank (CST) after reactor shutdown. The CST is used to support CS system operation for injection flow testing, for transferring of condensate to the reactor, or for core cooling. Four spray spargers, one pair for each loop, are located inside the reactor shroud above the core to provide distribution of the CS flow over the top of the fuel bundles.

During LOCA-initiated CS operation, the core spray pumps take suction from the suppression pool and discharge water over the top of the core. Water will leak through the break in the reactor coolant pressure boundary into the drywell. The leaking water will drain through the pressure suppression vents back to the suppression pool, establishing a closed loop.

The CS keep-full subsystem is provided to maintain the CS system discharge piping in a full condition. The subsystem consists of a hold pump and associated piping, valves, instrument and controls.

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

- Remove decay heat by spraying water over the fuel assemblies.
- Maintain integrity of reactor coolant pressure boundary.
- Support primary containment isolation.
- Provide suction flow from the suppression pool.

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

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

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

- The CS system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Section 6.4

Components Subject to Aging Management Review

Class I components with the intended function of maintaining the reactor coolant pressure boundary are reviewed with the RCS (Section 2.3.1). Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining CS components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-FM-20A
LRA-FM-23A

2.3.2.3 Automatic Depressurization

System Description

The purpose of the automatic depressurization system (ADS), which encompasses the pressure relief system described in UFSAR Section 4.4, is to prevent over-pressurization of the reactor coolant system and to provide automatic depressurization for small breaks in the reactor coolant system so that LPCI and the core spray system can inject water into the reactor vessel. The system includes safety/relief valves (SRVs), the SRV discharge lines to the suppression pool, and the main steam lines from the reactor vessel out to but not including the first main steam isolation valve.

The SRVs are located on the main steam lines within the drywell, between the reactor vessel and the first main steam isolation valves. The valves are dual purpose in that they relieve pressure by normal mechanical action or by automatic action of an electric-pneumatic control system. The relief by normal mechanical action is intended to prevent overpressurization of the reactor coolant system. The depressurization by automatic action of the control system is intended to reduce reactor coolant system pressure during a small break loss-of-coolant accident.

Each SRV is equipped with a nitrogen accumulator and check valve arrangement. These accumulators ensure that the valves can be held open following failure of the nitrogen supply to the accumulators.

Each SRV has its own discharge line to a point below the minimum water level in the primary containment suppression pool, permitting the steam to condense in the pool. A tee-quencher assembly at the discharge end of each line permits the discharge steam from the SRVs to be distributed through one or more bays of the suppression pool. Vacuum relief valves are provided on each SRV discharge line to prevent drawing water up into the line due to steam condensation following termination of safety/relief valve operation.

A main steam line flow restrictor is provided for each of the four main steam lines. The restrictor is a complete assembly welded into the main steam line downstream of the main steam line safety/relief valves and between the reactor vessel and the first main steam line isolation valve. The restrictor limits the coolant blowdown rate from the reactor vessel in the event a main steam line break occurs outside the primary containment.

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

- Maintain reactor coolant pressure boundary.
- Provide a steam flow path from the reactor coolant system through the safety/relief valves to the suppression pool.
- Reduce inventory loss via flow restrictors during main steam line pipe break.

- Maintain the integrity of the SRV nitrogen accumulator system up to the supply check valve.
- Provide pressure boundary for instrument N2 supply to ADS.

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

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

- ADS is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Sections 4.4 (pressure relief system), 6.4.2, 7.4.3.3

Components Subject to Aging Management Review

ADS components supplying N_2 and air to the safety/relief valve operators are evaluated with the instrument air system (Section 2.3.3.10). The pressure relief valves themselves and other piping and components upstream of the valves are included with the reactor coolant system pressure boundary (Section 2.3.1.3) since they are part of the nuclear system Class 1 pressure boundary. Remaining ADS components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-FM-29A

2.3.2.4 High Pressure Coolant Injection

System Description

The purpose of the high pressure coolant injection (HPCI) system, as part of the emergency core cooling systems (ECCS), is to limit, in conjunction with the primary and secondary containments, the release of radioactive materials to the environs following a loss-of-coolant accident (LOCA) so that resulting radiation exposures are kept within the guideline values given in 10 CFR 100. This purpose is primarily achieved by maintaining core coolant inventory to prevent fuel damage.

The HPCI system consists of a steam turbine-driven centrifugal main pump, a booster pump, piping, valves, controls, and instrumentation. The HPCI system is designed to pump water into the reactor vessel over a wide range of pressures. The system uses demineralized water supplied by a common header from the two condensate storage tanks. The system can also draw from the suppression pool. Water from either source is pumped into the reactor vessel via a feedwater line. Flow is distributed within the reactor vessel through feedwater spargers.

Decay heat and residual heat generate steam in the reactor, a portion of which is extracted from a main steam header upstream of the main steam line isolation valves to drive the HPCI system turbine. The inboard HPCI isolation valve and the outboard bypass isolation valve are normally open to keep the steam inlet piping hot, permitting rapid startup of the HPCI system. A condensate drain pot is upstream of the turbine stop valve. The condensate is normally routed to the radwaste system, but upon receipt of a HPCI system initiation signal or loss of control air pressure, two isolation valves on the drain line shut automatically.

The HPCI system turbine gland seals are vented to the HPCI system gland seal condenser, and part of the water from the HPCI system booster pump is routed through the condenser for cooling purposes. Non-condensable gases from the gland seal condenser are vented by a gland exhauster to the standby gas treatment system.

The main pump, turbine (including thrust bearing), and speed reducer bearings are supplied oil by a HPCI lube oil system. A motor-driven pump is used when speed is too low for the shaft-driven pump to supply the lube oil system. This system contains a lube oil cooler that is supplied water from the booster pump discharge.

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

- Provide core cooling following a design basis accident that results in low reactor vessel level or high drywell pressure.
- Support primary containment isolation.

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

- The HPCI system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).
- Provide makeup water to the reactor vessel during a station blackout (10 CFR 50.63).

UFSAR References

Sections 6.4, 8.11

Components Subject to Aging Management Review

ASME Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed with the RCS (Section 2.3.1.3). Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining HPCI 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-FM-18B	LRA-FM-25A
LRA-FM-20A	LRA-FM-25B
LRA-FM-20B	LRA-FM-48A

2.3.2.5 Reactor Core Isolation Cooling

System Description

The purpose of the reactor core isolation cooling (RCIC) system is to provide core cooling during reactor isolation by pumping makeup water into the reactor vessel in case of a low water level in the reactor vessel. The RCIC system also provides makeup water to the reactor vessel during total loss of offsite power.

The RCIC system consists of a steam-driven turbine-pump unit and associated valves and piping capable of delivering make-up water to the reactor vessel. RCIC normally takes suction from the demineralized water in the condensate storage tanks. A back-up supply is available from the suppression pool. RCIC also connects to the RHR system, enabling RCIC alignment to the RHR system when the RHR system operates in the steam condensing mode. RCIC injection to the vessel occurs through the feedwater line. RCIC shares suction points and full flow test lines with HPCI.

Steam from the B main steam header powers the turbine pump assembly. RCIC pump discharge returns to the reactor vessel via feedwater header A. The RCIC pump discharge also provides cooling water for the barometric condenser and the RCIC turbine lube oil cooler.

A pump driven by the steam turbine discharges lubricating oil to the RCIC pump and turbine bearing housings and the turbine governor through an oil filter and cooler. Oil from the turbine oil pump also feeds the turbine governor actuator.

The barometric condenser receives leakoff from the turbine seals, valve stems, and exhaust line drains. A vacuum pump maintains the necessary low pressure in the barometric condenser while a condensate pump maintains the required water level. Steam condensed within the barometric condenser is pumped to the suction of the RCIC pump, and non-condensable gases are pumped to the suppression pool.

The RCIC system has the following intended functions for 10 CFR 54.4(a)(1). Core cooling during reactor isolation is not a safety function for RCIC because the emergency core cooling systems provide the safety-related means of cooling during design basis events.

- Maintain integrity of reactor coolant pressure boundary.
- Support primary containment isolation.
- Provide vacuum break in exhaust steam line.

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).

- The RCIC system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).
- Provide makeup water to the reactor vessel during a station blackout (10 CFR 50.63).

UFSAR References

Section 4.7

Components Subject to Aging Management Review

ASME Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed with the RCS (Section 2.3.1.3). Ventilation components and fire damper housings in the RCIC system are evaluated with the HVAC systems (Section 2.3.2.7). Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining RCIC components 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 drawings.

LRA-FM-22A

LRA-FM-22B

2.3.2.6 Gas Handling (Including Standby Gas Treatment)

System Description

The gas handling system includes mechanical components in the following subsystems:

- Off-gas – holdup
- Standby gas treatment

The purpose of the off-gas – holdup (OGH) system is to collect, process, hold, and control the gaseous radioactive waste being released from the main condenser air ejector. Discharge of this gas to the atmosphere is through the main stack, which also serves as the release point for gaseous waste from the start-up mechanical vacuum pump (condenser air removal pump) and the gland seal condenser (steam packing exhauster).

During normal operation, the hydrogen and oxygen in the condenser off-gas are recombined prior to passing through (1) a moisture removal process, (2) charcoal beds for retention of Xe and Kr, and (3) high efficiency particulate absolute (HEPA) filters for the removal of carbon dust before the off-gas exits through the stack. A two-inch line transfers the effluent from the recombiner directly to the charcoal beds in the main stack.

If the off-gas recombiner is inoperable, the off-gas is routed to the 24-inch holdup pipe before exiting to the main stack, where dilution air is provided to reduce the hydrogen concentration to below the limit of four percent hydrogen by volume. The off-gas passes through the drip pot prior to entering the holdup pipe. The drip pot is designed to collect excess moisture and return it to the main condenser. The holdup pipe, by design, drains back to the drip pot so that any moisture in the off-gas effluent condensing in the pipe in the journey to the stack will be returned.

The dilution air fans and charcoal beds are located in the base of the stack. The stack design ensures prompt mixing of gas inlet streams at its base thereby providing prompt dilution of hydrogen and allowing the location of sample points as near the base as possible. The main stack drainage is routed to the reactor building equipment drain sump.

While automatic isolation of the OGH system is radiologically advantageous, it is not necessary to ensure compliance with 10 CFR 100 guidelines. In all cases analyzed, the OGH system can remain unisolated and the releases will still be within 10 CFR 100 guidelines. The OGH system does not perform any safety functions.

The off-gas system has no intended functions for 10 CFR 54.4(a)(1) or (a)(3).

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

- Nonsafety-related valves of the off-gas system that interface with the standby gas treatment system support the intended functions of the SGT system.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The purpose of the standby gas treatment (SGT) system is to process gaseous effluent from the primary and secondary containment when required to limit the discharge of radioactive materials to the environs and limit exfiltration from the secondary containment during periods of primary containment isolation. The system functions as part of the secondary containment system. The SGT system is designed to limit the release of radioactive material to the environment such that the offsite dose from a postulated design basis accident (DBA) is within the limits of 10 CFR 100 or 10 CFR 50.67(b)(2). During normal plant operation, the SGT system treats potentially radioactive gases prior to discharge to the environment.

The standby gas treatment system consists of two identical, physically and electrically separated air filtration trains. Each of the filtration trains is full capacity. Each consists of a demister, a prefilter, an electrical heating coil, a HEPA filter, an activated charcoal adsorber, a HEPA after filter and an exhaust fan. With the reactor building isolated, each of the two fans has the capacity necessary to reduce and hold the building at a sub-atmospheric pressure. The system includes isolation valves which are normally closed.

Upon receipt of an initiation signal, at least one filter train fan will start, and valves in that train will open to draw air from the isolated reactor building. The operator may then select which filter train to stop should both start. A vacuum relief valve is installed for vacuum protection of the reactor building.

Effluent from the drywell and torus purge exhaust, high pressure coolant injection system exhaust, reactor vessel head vent system and exhaust, and main steam leakage collection system exhaust is directed to the standby gas treatment system for processing before release up the main stack. The standby gas treatment system can be utilized to permit leak tests on the reactor building.

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

- Provide filtration of particles and adsorption of iodine from the entering gas stream to limit the discharge activity for entering gas streams from reactor building and main steam leakage collection system.
- Maintain reactor building pressure sub-atmospheric after initiation.

The SGT 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.

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

UFSAR References

Sections 5.3.3.4 and 11.4 (Section 11.4 describes the gaseous radwaste system, which includes the condenser and gland seal off-gas systems which are part of the off gas - holdup system as defined by the equipment database.)

Components Subject to Aging Management Review

Nonsafety-related gas handling system portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining gas handling system 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-FB-8A
LRA-FM-16A
LRA-FM-18B
LRA-FM-29A
LRA-FM-38A
LRA-FM-44A
LRA-FM-48A

2.3.2.7 Primary Containment Penetrations

System Description

The purpose of the primary containment (PC) system, in conjunction with other engineered safeguards, is to limit the release of fission products in the event of a postulated design basis accident so that offsite doses do not exceed the guideline values set forth in 10 CFR 100. The primary containment system is of the pressure suppression type and houses the reactor vessel, the reactor recirculating loops, and other branch connections of the reactor coolant system. The system includes a drywell, a pressure suppression chamber (torus) which stores a large volume of water (pressure suppression pool), the connecting vent system between the drywell and the pressure suppression pool, isolation valves, the vacuum relief system, and the RHR subsystems for containment cooling. Instrumentation and instrument connections are provided so that integrated containment leakage rate tests may be periodically performed during periods of reactor shutdown.

The primary containment system as described in the UFSAR encompasses the mechanical and electrical systems and structures that establish and maintain primary containment conditions during normal and accident conditions and limit the release of fission products in the event of a postulated design basis accident. Electrical systems are in scope by default and are not discussed further in this section. Structural components are evaluated in Section 2.4.1, Reactor Building. The intended functions performed by mechanical components of the PC system are described below.

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

- Support primary containment isolation.

The system has the following mechanical 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 system has no intended functions for 10 CFR 54.4(a)(3).

UFSAR References

Section 5.2

Components Subject to Aging Management Review

Primary containment structural components, including equipment and personnel hatches, are evaluated with the reactor building structure (Section 2.4.1). The internals of electrical penetration assemblies are reviewed with the electrical systems (Section 2.5). Nonsafety-related portions of the primary containment system that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14).

Mechanical penetrations for systems with a system-level aging management review are reviewed with that system. This review includes the containment penetration portion of systems that do not have a system-level aging management review as well as containment penetration components of the PC system. The grouping of containment isolation valves from various plant systems into one consolidated review is appropriate, as stated in NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, Section 2.1.3.1.

There are several QA Category 1 valves on unused piping penetrations. Where a welded cap provides permanent closure of the penetration, it acts as an extension of the containment and the valve is not needed to assure containment isolation. Therefore these valves do not perform an intended function for license renewal and are not subject to aging management review.

Primary 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-FM-17A
LRA-FM-26A
LRA-FM-39A
LRA-FM-39B
LRA-FM-46C
LRA-FM-47A
LRA-FM-49A

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

Component Type	Intended Function(s)
Bolting	Pressure boundary
Cyclone separator	Pressure boundary Filtration
Flow element	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Nozzle	Pressure boundary Flow control
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Component Type	Intended Function(s)
Bolting	Pressure boundary
Cyclone separator	Pressure boundary Filtration
Flow element	Pressure boundary
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Tubing	Pressure boundary
Valve Body	Pressure boundary

Table 2.3.2-3
Automatic Depressurization System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Piping	Pressure boundary
T-quencher	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-4
High Pressure Coolant Injection System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bearing housing	Pressure boundary
Blower housing	Pressure boundary
Bolting	Pressure boundary
Drain pot	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Gear box housing	Pressure boundary
Governor housing	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Rupture disk	Pressure boundary
Sight glass	Pressure boundary
Steam trap	Pressure boundary
Strainer	Filtration
Tank	Pressure boundary
Thermowell	Pressure boundary

Table 2.3.2-4 (Continued)
High Pressure Coolant Injection System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Tubing	Pressure boundary
Turbine casing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-5
Reactor Core Isolation Cooling
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flow meter housing	Pressure boundary
Governor housing	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Steam trap	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 2.3.2-6
Standby Gas Treatment System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Damper housing	Pressure boundary
Duct	Pressure boundary
Fan housing	Pressure boundary
Filter	Filtration Pressure boundary
Filter unit housing	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Sight glass	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Component Type	Intended Function(s)
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3 Auxiliary Systems

The following systems are described in this section.

- standby liquid control
- service water
- emergency diesel generator
- fuel oil
- fire protection – water
- fire protection – CO_2
- heating, ventilation and air conditioning
- containment purge, containment atmosphere dilution, and post-accident sampling
- fuel pool cooling and cleanup
- service, instrument, and breathing air
- reactor building closed loop cooling water
- radwaste and plant drains
- security generator
- miscellaneous systems in scope for (a)(2)

2.3.3.1 Standby Liquid Control

System Description

The purpose of the standby liquid control (SLC) system is to provide a backup method, independent of control rods, to bring and maintain the reactor subcritical from the most reactive conditions as reactor coolant cools. Maintaining subcriticality thus ensures that the fuel barrier is not threatened by overheating in the improbable event that not enough of the control rods can be inserted to counteract the positive reactivity effects of a colder moderator.

The SLC system consists of a stainless steel boron solution tank, a test water tank, a drain tank, two positive-displacement pumps, two explosive valves, and associated local valves and controls mounted in the reactor building outside primary containment. The liquid is piped through stainless steel piping into the reactor vessel and discharged below the core support plate where it mixes with the cooling water rising through the core.

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

- Provide borated water to the reactor coolant system.
- Support primary containment isolation.
- Support isolation of reactor water cleanup (RWCU) system to prevent filtration and ion-exchange when standby liquid control is initiated.
- Maintain integrity of reactor coolant 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 performs the following intended function for 10 CFR 54.4(a)(3)

- The system is credited to mitigate the effects of an anticipated transient without scram (ATWS) (10 CFR 50.62).

UFSAR References

Section 3.9

Components Subject to Aging Management Review

ASME Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed with the RCS (Section 2.3.1). Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining SLC components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-FM-21A

2.3.3.2 Service Water

System Description

The purpose of the service water (SW) system is to provide cooling water to safety-related and nonsafety-related plant components. The emergency service water system provides cooling to emergency core cooling system components and other equipment essential to safe reactor shutdown following a design basis LOCA. The normal service water system provides a heat sink during normal operation for the turbine building and reactor building heat loads.

The emergency SW (ESW) system consists of two independent supply loops, each supplied from one emergency service water pump in a separate bay in the pumphouse, taking suction from Lake Ontario. Twin basket strainers are located at each pump discharge. When in operation, the system discharges to the circulating water discharge tunnel and back to Lake Ontario.

The control room and relay room air handling units, normally supplied cooling flow by a closed loop glycol system, can also be supplied by either the emergency or normal SW systems.

The normal SW system is in operation during normal power operation. Three nonsafety-related pumps in the screenwell-pumphouse building take suction from Lake Ontario. Two pumps normally operate and discharge through automatic self-cleaning strainers into a common manifold. The return flow from the system enters the circulating water discharge tunnel, where it mixes with the circulating water flowing back into Lake Ontario.

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

- Provide ESW cooling water to the following components.
  - control room and relay room air handling units
  - crescent area unit coolers
  - EDG jacket cooling water heat exchangers
  - electrical bay unit coolers
  - cable tunnel and switchgear unit coolers

- Support primary containment isolation.

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

- The SW system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Section 9.7

Components Subject to Aging Management Review

Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining SW components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-FB-10H	LRA-FM-15B	LRA-FM-46A
LRA-FB-35E	LRA-FM-18C	LRA-FM-46B
	LRA-FM-20B	

2.3.3.3 Emergency Diesel Generator

System Description

The purpose of the emergency diesel generator (EDG) system is to provide a supply of onsite AC power, adequate for the safe shutdown of the reactor following abnormal operational transients and postulated accidents. The EDG system includes four diesel generator units, each with an air start system and fuel oil system.

Each EDG includes several mechanical auxiliary systems that support operation. Each engine has a closed-loop jacket water cooling system, which circulates corrosion-inhibited coolant through the engine cylinder liners, lube oil cooler, and turbocharger aftercoolers during engine operation. Each engine is equipped with three engine-driven lube oil gear pumps, which circulate clean, cool lubricating oil during engine operation. Each engine has a combustion air intake system, which draws air through the air intake filter from a hooded opening in the EDG building roof into the compressor side of the turbocharger. The exhaust system, consisting of the turbocharger, muffler, piping, and expansion joint, removes the combustion gases through the roof.

Each EDG has one air-start system, with in-service and reserve air banks. The in-service air bank supplies all four air-start motors. The air-start system consists of air tanks, oil fog lubricators (oil-mist), and air-start solenoid valves that supply pressurized air to air-start motors. High-pressure air powers the air motors to crank the engine.

Each EDG has an independent fuel oil system, which provides for the storage and delivery of fuel oil to the engine. The fuel oil system for each EDG consists of a storage tank, transfer pump, day tank, automatic level control system, an engine-driven fuel pump, and DC motor-driven fuel pump.

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

- Provide a single-failure proof supply of on-site AC power adequate for the safe shutdown of the reactor.

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

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

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

- The system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Sections 8.6.1, 8.6.2, 8.6.3 and 8.6.4

Components Subject to Aging Management Review

Components that supply fuel oil are reviewed with the fuel oil system (Section 2.3.3.4). Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining EDG 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-FM-93A	LRA-FM-46B
LRA-FM-93C	LRA-FM-94A

2.3.3.4 Fuel Oil

System Description

Fuel oil components at JAFNPP are not designated as comprising a separate fuel oil system. Rather, fuel oil components are included with the emergency diesel generator system and the fire protection system. However, these components are evaluated as a group, similar to the approach taken with containment penetrations. The grouping of fuel oil components from various plant systems into one 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.

The purpose of diesel fuel oil components is to provide for the storage and transfer of fuel oil to the EDG and fire protection systems. Fuel oil components include bulk storage tanks, day tanks, transfer pumps, piping, and valves.

Each diesel generator unit is provided with an independent fuel oil system consisting of a main fuel storage tank, a day tank and pumps. Two full-capacity motor-driven pumps are provided for filling the day tank from the storage tank. An engine-driven pump and a DC motor-driven pump are provided to pump fuel from the day tank to the fuel injectors and are arranged so as to provide two redundant engine fuel pumping systems.

Fuel oil components have the following intended function for 10 CFR 54.4(a)(1).

- Support operation of the emergency diesel generators.

Fuel oil components 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.

Fuel oil components have the following intended functions for 10 CFR 54.4(a)(3).

- Operation of the diesel-driven fire pump and the emergency diesel generators is credited in the 10 CFR 50 Appendix R safe shutdown capability analysis (10 CFR 50.48).

UFSAR References

Sections 8.6 and 9.8.3

Components Subject to Aging Management Review

Nonsafety-related components that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining fuel oil components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-FB-48A
LRA-FM-93A

2.3.3.5 Fire Protection – Water

System Description

The purpose of the fire protection (FP) system is to provide adequate fire protection capability in all areas of the plant where a fire hazard may exist. The fire protection system includes the fire water system, foam systems and CO_2 system. The fire protection – CO_2 system is described in Section 2.3.3.6.

The fire protection – water system consists of a water supply, pumping facilities, and distribution piping and components necessary for fire suppression. Water from Lake Ontario passing through the screenwell provides a reliable supply of fresh water for fire fighting. Electric motor and diesel engine driven water pumps discharge into the yard main and an underground loop encircling the entire plant that provides water supply to fixed fire suppression systems, interior hose stations and exterior fire hydrants. Manual fire suppression is available from exterior fire hydrants surrounding the power block and from hose stations located inside power block areas. Fire suppression by at least one manually controlled hose stream is available in all areas except primary containment. The fixed fire protection systems include deluge and preaction systems with unpressurized empty pipes controlled by a heat detection system; pressurized wet pipe systems; and pressurized dry pipe systems with air in the pipes and automatic "closed" sprinkler heads.

An air foam system with timed air foam discharge cycle is provided to blanket the condenser pit as well as any oil floating on any water accumulation in the condenser pit. A manually initiated water foam system is provided as a backup to the HPCI pump room water spray system. Foam pickup tubes and applicator nozzles are provided for manual firefighting.

The FP – water system has no intended functions for 10 CFR 54.4(a)(1).

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

- Detect and mitigate fires in safety-related areas.
- Detect and mitigate fire in the east and west diesel fire pump rooms.
- Provide a source of water supply to fixed fire suppression systems, interior hose stations and exterior fire hydrants.
- Provide manual fire suppression using hose stations located in power block areas.
- Provide manual fire suppression using fire hydrants surrounding the power block.

UFSAR References

Section 9.8

Components Subject to Aging Management Review

Fire barriers, hose reels for fire hoses, and structural steel fireproofing are evaluated with the structure in which they are located or with the structural bulk commodities review. Components in the fuel oil supply to the diesel fire pump are evaluated with fuel oil components (Section 2.3.3.4). Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components (10 CFR 54.4(a)(2)) are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining fire protection – water system components are reviewed as listed below.

Table 2.3.3-5 lists the fire protection – water component types that require aging management review.

Table 3.3.2-5 provides the results of the fire protection – water aging management review.

License Renewal Drawings

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

LRA-FB-48A

LRA-FB-49A

LRA-FB-49B

LRA-FB-56A

2.3.3.6 Fire Protection – CO_2

System Description

The purpose of the fire protection (FP) system is to provide adequate fire protection capability in all areas of the plant where a fire hazard may exist. The fire protection system includes the fire water system, foam systems and carbon dioxide (CO_2) system. The fire protection – water system (which includes foam) is described in Section 2.3.3.5.

The FP – CO_2 system is for fire protection in areas where use of a water spray or a sprinkler system is not feasible. Fixed total flooding carbon dioxide suppression systems are provided for the cable spreading room, cable run rooms, relay room, each of the two electrical bay switchgear rooms, and each of the two emergency diesel-generator switchgear rooms. Liquid carbon dioxide is stored in two refrigerated low pressure tanks. A three-ton low pressure storage tank supplies the systems in the emergency diesel-generator switchgear rooms and a nearby CO_2 system hose reel station in the turbine building. A ten-ton low-pressure storage tank supplies the remaining systems and two hose stations. The ten-ton tank also provides carbon dioxide to purge the main generator hydrogen system.

The FP – CO_2 system has no intended functions for 10 CFR 54.4(a)(1).

The FP – CO_2 system has no intended functions for 10 CFR 54.4(a)(2)

The FP – CO_2 system has the following intended functions for 10 CFR 54.4(a)(3).

- Detect and mitigate fires in safety-related areas.
- Provide manual fire suppression using the CO2 hose stations located in the turbine building.

UFSAR References

Section 9.8

Components Subject to Aging Management Review

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

LRA-FB-56A

2.3.3.7 Heating, Ventilation and Air Conditioning

System Description

The purpose of the heating, ventilation, and air conditioning (HVAC) systems is to control the station air temperatures and the flow of airborne radioactive contaminants to ensure the operability of station equipment and the accessibility and habitability of station buildings and compartments. The heating, ventilation, and air conditioning systems include numerous systems which together comprise plant HVAC equipment. The HVAC systems have been individually evaluated for inclusion in the scope of license renewal and are described below.

Reactor Building Ventilation

The purpose of the reactor building ventilation (RBV) system (which includes crescent area ventilation and cooling) is to control ambient temperatures, humidity, and the flow of potential airborne radioactive contaminants. This ensures operability of equipment and accessibility and habitability of plant buildings and compartments.

The reactor building is served by one supply ventilation system and two exhaust systems. The reactor building supply ventilation system is augmented by booster fans located in the crescent area to minimize the overall duct system pressure requirements. The refueling level is exhausted by a system equipped with a ten-second delay duct and dual radiation monitors. The remainder of the reactor building is exhausted by the reactor building exhaust system. The system is started manually but is isolated automatically. All exhaust air from the reactor building secondary containment is discharged through a common duct to the roof stack, which is equipped with dual radiation monitors and isolation butterfly valves.

The equipment is configured for once-through ventilation (with minimal recirculation for differential pressure control) during normal operation. In the event of a loss of coolant accident (LOCA) or a postulated fuel handling accident, the system is isolated and placed in recirculation mode. Where safeguard equipment designed to operate during emergencies is installed, the outside supply air is sufficient to cool the area during normal operation. In an emergency, when the ventilation system is not functioning, the unit coolers are able to handle the entire heat gain load without outside air supply. The water supply to the cooling coils is from the normal service water or emergency service water system.

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

- Provide system isolation on receipt of a high radiation signal.
- Remove heat from engineered safeguards equipment in the crescent area.
- Provide sample flow from the reactor building to the hydrogen/oxygen monitors in the primary containment atmosphere control and dilution system.

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

- Provide automatic closure of fire dampers in the event of a fire.
- The crescent area ventilation system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

Turbine Building Ventilation

The purpose of the turbine building ventilation (TBV) system (which includes electric bay and cable tunnel ventilation and cooling) is to control the plant ambient temperatures, humidity, and the flow of potential airborne radioactive contaminants. The turbine building ventilation system supplies filtered and tempered outdoor air to the operating floor and all other areas below the operating floor.

The turbine building ventilation system consists of turbine building general area ventilation and cooling system, electrical bays ventilation and cooling system, and cable tunnels ventilation and cooling system.

The turbine building general area ventilation and cooling system supplies filtered air to all areas of the turbine building. The air is routed to areas of progressively greater radioactive contamination potential prior to final exhaust, providing once-through ventilation cooling with minimal recirculation for differential pressure control. Heating coils heat outside supply air when necessary by modulating the amount of a glycol-water mixture through the coils. Unit coolers supplied by normal service water are used when necessary.

The electrical bays ventilation and cooling system services the east and west electrical bays with primary cooling provided by two separate unit coolers, one unit cooler for each bay. The cooling coils are served with normal or emergency service water.

Primary heating to the electrical bays is provided by several unit heaters supplied with glycol-water from the auxiliary boiler system.

The cable tunnels ventilation and cooling system includes two redundant cable tunnels (east and west), cooled by two independent ventilation and cooling systems. Each ventilation and cooling system consists of filters, a cooling coil supplied by normal or emergency service water, and two vane axial fans. The fans supply filtered outside air to the cable tunnels through distributed duct work and supply air registers and to the emergency diesel generator switchgear rooms.

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

- Provide area cooling for electrical bay area and for cable tunnels.

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 functions for 10 CFR 54.4(a)(3).

- Provide automatic closure of fire dampers in the event of a fire.
- The electric bay and cable tunnel ventilation system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

Drywell Ventilation and Cooling

The purpose of the drywell ventilation and cooling system is to circulate cooled nitrogen around the drywell, including areas around the reactor recirculation pumps and motors, the control rod drive area and the annular space between the reactor vessel and the primary shield.

The drywell ventilation and cooling system consists of two unit cooler assemblies connected to ductwork which distributes cooled nitrogen or air throughout the drywell. Each assembly consists of filters, cooling coils, and vane axial re-circulating fans with discharge air dampers. The reactor building closed loop cooling water (RBCLCW) system cools the cooling coils. The emergency service water system serves as a backup to portions of the RBCLCW system. The discharge air dampers are pneumatically powered by nitrogen from the drywell N_2 distribution system.

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

- Provide pressure boundary for instrument N_2 distribution system in the drywell.

The drywell ventilation and 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 drywell ventilation system has no intended function for 10 CFR 54.4(a)(3).

Radwaste Building Ventilation

The purpose of the radwaste building ventilation system (which includes interim radwaste storage building ventilation and cooling) is to provide adequate ventilation to remove heat rejected from operating equipment compartments to maintain required space temperatures.

The radwaste building ventilation system consists of radwaste building HVAC and east pipe tunnel HVAC. The radwaste building HVAC system maintains building space temperatures through the use of supply fans to an air handling unit with cooling coils (supplied by normal service water) and heating coils (supplied by glycol-water) to meet space temperature requirements. Air is exhausted through ducting in the building roof. The east pipe tunnel HVAC system uses an air handling unit to supply outside air to the east pipe tunnel. The supply air is heated by a glycol heating coil and filtered by two filters. Air exhaust is supported by the radwaste building exhaust fan.

Radwaste building ventilation has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

Radwaste building ventilation has the following intended function for 10 CFR 54.4(a)(3).

- Provide automatic fire damper closure in the event of fire.

Control Room and Relay Room Ventilation and Cooling

The purpose of the control and relay rooms ventilation and cooling system is to provide adequate ventilation, heating, cooling and relative humidity for the control and relay rooms. The control and relay room air conditioning systems operate independently of other plant heating, air conditioning and ventilating services. These systems must operate at all times during normal, shutdown, and design basis accident conditions.

The control and relay room ventilation systems consist of control room ventilation and cooling (CRHV) and relay room ventilation and cooling (RRHV). The CRHV system provides ventilation and cooling for the control room, which houses electrical and control equipment, the operations office, a kitchen, a toilet, and a corridor area. Two air handling units (AHUs) with a centrifugal fan and a cooling coil provide cooled air to the control room areas by means of distributed ductwork, diffusers and registers. The cooling coils are supplied with chilled water from the control and relay room chilled water system (RWC). They can also be supplied by normal or emergency service water. Two return fans located in the ventilation equipment room return air from the control room areas through the equipment room.

The RRHV system provides ventilation and cooling for the relay room located below the control room. Two air handling units with a centrifugal fan and a cooling coil are provided to supply cooled air to the relay room by means of distributed ductwork and registers. The AHU cooling coils are supplied with chilled water from the RWC system or normal service water. Two return fans remove air from the relay room by connected ductwork for return or exhaust as required.

The control / relay room ventilation system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide ventilation pressure boundary for the control room.
- Provide cooling to control and relay rooms using air handling unit fed from emergency service water.

The control / relay room ventilation system has no intended function for 10 CFR 54.4(a)(2).

The control / relay room ventilation system has the following intended functions for 10 CFR 54.4(a)(3).

- Provide for automatic closure of fire dampers in the event of fire.
- The control / relay room ventilation and cooling system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

Administration Building Ventilation and Cooling

The purpose of the administration building ventilation and cooling system is to provide adequate ventilation, heating, cooling, and relative humidity for areas within the administration building. This system includes the administration building ventilation and cooling (ABV), administration and support building ventilation and cooling; warehouse building ventilation and cooling; station battery room ventilation and cooling (SBRV); service water for admin building cooling; and technical support center/EPIC room ventilation (TSC).

The ABV system supplies outside air to the laboratory through an air handling unit with glycol-water heating coils and direct expansion cooling coils. A separate exhaust fan removes air.

The administration and support building ventilation consists of air handling equipment located in an equipment room in the administration and support building which supplies air to the office area with a combination of glycol-water heating coils and direct expansion cooling coils.

The warehouse building ventilation system consists of an air handling unit, a return air fan and an exhaust fan which are located in an equipment room in the warehouse. An air handling unit, which filters and heats the air as necessary, supplies air to the shop, tool room, stores, locker room, hall, health physics room, elevator machine room and equipment room.

The battery room HVAC (SBRV) system consists of separate air handling units, return fans, and exhaust fans located on the roof of each battery room. The equipment, ductwork and controls are completely independent from other plant ventilating services. The system independence ensures uninterrupted operation during normal shutdown and design basis accident modes.

The TSC HVAC system provides filtered outside air to a booster fan to maintain positive pressure in the TSC. When operation of the TSC is required, the administration building normal HVAC system operation is configured to supply air only to the TSC.

The administration building ventilation and cooling system has the following intended function for 10 CFR 54.4(a)(1).

- Maintain ventilation and reasonably constant temperature in the battery rooms.

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

- Provide for automatic closure of fire dampers in the event of fire.
- The systems are credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

Screenwell and Water Treatment Ventilation System

The purpose of the screenwell and water treatment ventilation system is to provide ventilation and heating to areas within the screenwell / water treatment building.

The screenwell house ventilation system supplies outside air for cooling the screenwell house general area, the ESW pump rooms, and the diesel fire pump rooms. Air is supplied to the general area by four roof-mounted supply air fans and exhausted by two banks of air movers. There are two ESW pump rooms which house both the RHR service water pumps and ESW pumps with one room containing an electric fire pump. The ESW pump rooms are equipped with exhaust fans discharging air to the general area. Unit heaters provide heating during winter.

The screenwell and water treatment ventilation system has the following intended function for 10 CFR 54.4(a)(1).

- Maintain environmental conditions within the safety pump rooms for RHRSW and ESW for postulated accidents.

The screenwell and water treatment ventilation system has the following intended function for 10 CFR 54.4(a)(2).

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

The screenwell and water treatment ventilation system has the following intended functions for 10 CFR 54.4(a)(3).

- Provide ventilation for the east and west diesel fire pump rooms.
- Provide for automatic closure of fire dampers in the event of fire.
- The system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

EDG Building Heating, Ventilation and Air Conditioning

The purpose of the EDG building heating, ventilation and air conditioning (EDGV) system is to provide heating and ventilation to the emergency diesel generator rooms and EDG switchgear rooms.

The emergency diesel generator rooms are heated by electric unit heaters. A thermostatic control shuts down the unit heater after the emergency diesel generator heats the room. The emergency diesel generator building ventilation system supplies ventilation air to each emergency generator room via separate fans and ductwork. Two building inlets provide outside air to two duct type plenums. Each plenum is connected by ductwork to two fans with each fan arranged to supply air to or recirculate air from one emergency diesel generator room. To regulate room temperature, a temperature indicating controller controls outside air, recirculating air, and exhaust air modulating dampers. Ventilation is also provided to the EDG switchgear rooms.

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

- Start ventilation fans automatically whenever diesel generators are started.
- Maintain EDG Rooms at acceptable temperatures.
- Provide cooling for EDG switchgear rooms.

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

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

- Provide for automatic closure of fire dampers in the event of fire.
- The system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

Ventilation Radiation Monitoring Subsystem of Process Radiation Monitor System

The purpose of the process radiation monitor (PRM) system is to monitor process liquid and gas lines that may serve as discharge routes for radioactive materials. The PRM system consists of a number of radiation monitors and monitoring subsystems which provide automatic actions and control room indications.

These subsystems consist of mechanical and electrical components which are evaluated separately. Mechanical components are evaluated with the associated process system. The ventilation radiation monitoring subsystem includes mechanical components that perform intended functions for 10 CFR 54.4(a)(1).

The ventilation radiation monitoring subsystem of the PRM system has the following intended function for 10 CFR 54.4(a)(1).

- Initiate isolation of reactor building ventilation exhaust based on ventilation monitoring signal or refueling floor monitoring signal.

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

Security Building Ventilation

The security access building houses a propane powered generator for backup power to selected security loads and yard lighting. The outdoor lighting is credited in the JAFNPP Fire Hazard Analysis exemption for outdoor eight-hour Appendix R lighting. For engine cooling, the building is equipped with air intake louvers and discharge duct with air movement produced by the engine fan.

Security building ventilation has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

Security building ventilation has the following intended function for 10 CFR 54.4(a)(3).

- Provide security generator cooling.

UFSAR References

None for security building ventilation. Remaining HVAC systems are discussed in Sections 9.9.3.3, 9.9.3.4, 5.2.3.7, 9.9.3.5, 9.9.3.11, 9.9.3.6 and 9.9.3.10, 9.9.3.7, 9.9.3.9, and 7.12, respectively.

Components Subject to Aging Management Review

The radwaste building ventilation system has no mechanical components with an intended function. The system includes a fire damper required for fire protection, which is evaluated as a structural component with bulk commodities (Section 2.4.4).

Service water supply system components and components that interface with service water systems are evaluated with the service water systems (Section 2.3.3.2). Reactor building atmosphere sample valves supplying the hydrogen/oxygen analyzers are evaluated with CP/CAD/PASS system (Section 2.3.3.8). Safety-related components of the drywell ventilation and cooling system are evaluated with the instrument air system (Section 2.3.3.10). Nonsafety-related portions of HVAC systems that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining HVAC 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-FB-8A	LRA-FB-16C	LRA-FB-45E
LRA-FB-10H	LRA-FB-35E	LRA-FB-60A
LRA-FB-16A	LRA-FB-45A	LRA-FM-46A
LRA-FB-16B	LRA-FB-45C	LRA-FM-46B

2.3.3.8 Containment Purge, Containment Atmosphere Dilution, and Post-Accident Sampling

System Description

The containment purge, containment atmosphere dilution, and post-accident sampling (CP/CAD/PASS) system includes the primary containment atmosphere control and dilution system, drywell purge ventilation supply and exhaust systems, venting and vacuum relief system, and post-accident sampling system as described in the UFSAR. These systems share common components and flow paths and are considered together as the CP/CAD/PASS system.

The purpose of the CP/CAD/PASS system is to establish and maintain the desired atmosphere in the primary containment. The system provides the means to control the relative oxygen concentration by inerting the containment atmosphere with nitrogen or deinerting with outside air, to monitor containment hydrogen and oxygen concentrations, and to control primary containment pressure and differential pressure via makeup to or venting from the drywell and suppression chamber. The system also provides nitrogen to pneumatically operated instrumentation and controls in containment. The system provides the means to collect and analyze liquid and gaseous samples from containment following a loss-of-coolant accident.

The containment is inerted with nitrogen during normal power operation to maintain low oxygen concentration. The low oxygen concentration prevents combustion of hydrogen which would be released following an accident. The containment is inerted by supplying nitrogen to the torus and drywell until the required oxygen concentration is achieved. The containment atmospheric dilution is provided to control the combustible gases following a postulated design basis accident. Major components of the containment inerting process include the vent and purge supply fan, liquid nitrogen storage tanks, ambient vaporizers, electric heaters, and associated valves and piping.

The containment atmosphere is monitored via redundant dual range hydrogen and oxygen analyzers sampling at four separate locations, three in the drywell and one in the torus. The sample lines are redundant to each analyzer.

The primary containment is deinerted by supplying fresh outside air to the containment with a vent and purge supply fan. During both the inerting and deinerting process, the gas purged from the torus and drywell is processed by the SGT system prior to being exhausted to the atmosphere.

Nitrogen makeup is provided to maintain drywell pressure, drywell-to-torus differential pressure, and primary containment oxygen concentration within required limits. Instrumentation and pneumatically operated valves in the primary containment are supplied with nitrogen gas instead of air to prevent a buildup of oxygen in the containment. Containment isolation valves outside primary containment for the reactor building closed loop cooling water system also are supplied nitrogen.

The drywell purge ventilation supply system consists of a purge supply fan to supply clean air to the drywell for purge and ventilation during reactor shutdown and refueling periods for personnel access and occupancy. The purge exhaust nitrogen/air is passed through the SGT system and discharged through the main stack. Supply and exhaust piping is connected to both the drywell and suppression chamber (torus).

Vacuum-breaker valves are used to prevent primary containment pressure from dropping below the vacuum rating relative to the external design pressure. Five drywell vacuum-breaker valves draw non-condensables from the pressure suppression chamber to prevent the drywell vacuum rating from being exceeded. Two vacuum-breaker valves in parallel lines are provided between the reactor building and the pressure suppression chamber.

The post-accident sampling system is designed to obtain representative liquid and gaseous samples from within the primary containment and gaseous samples from within the secondary containment for radiochemical and chemical analysis in the event of a loss-of-coolant accident. From interpretation of this data, the extent of core damage and other radiological and chemical conditions existing in the plant can be predicted. The basic system consists of a liquid and gas sample station located in the reactor water recirculation pump motor generator set room outside the secondary containment structure. The system is also designed to provide useful samples under conditions ranging from normal shutdown and power operation to the design basis LOCA.

The CP/CAD/PASS system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide nitrogen into containment following any accident that could result in release of hydrogen.
- Provide long-term nitrogen supply to ADS valves following a LOCA.
- Provide piping and valves to direct containment atmosphere to the standby gas treatment system.
- Provide suppression chamber to drywell vacuum relief.
- Provide suppression chamber to reactor building vacuum relief.
- Support containment H_2/O_2 concentration monitoring.
- Support primary containment isolation.
- Provide long-term operability of air-operated reactor building closed loop cooling water system containment isolation valves.

The CP/CAD/PASS 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 CP/CAD/PASS system has the following intended function for 10 CFR 54.4(a)(3).

- The CP/CAD system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Sections 5.2.3.6, 5.2.3.7 (drywell purge ventilation supply system), 5.2.3.8, 5.2.3.14, and 9.14.4 (PASS).

Components Subject to Aging Management Review

The nitrogen to instrument air cross-tie valves are evaluated with the instrument air system (Section 2.3.3.10). Nonsafety-related portions of CP/CAD/PASS that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining CP/CAD/PASS 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 the components subject to aging management review are provided in the following license renewal drawings.

LRA-FM-18A
LRA-FM-18B
LRA-FM-18C
LRA-FM-18D
LRA-FM-39C

2.3.3.9 Fuel Pool Cooling and Cleanup

System Description

The purpose of the fuel pool cooling and cleanup (FPCC) system is to provide a criticality safe underwater storage location for spent fuel assemblies, which require shielding and cooling during storage and handling. The construction and configuration of the spent fuel racks precludes the possibility of criticality under normal and abnormal conditions. The spent fuel pool, fuel pool gates and connected cooling system piping is arranged to assure a minimum level over fuel seated in the pool to adequately shield plant personnel. The fuel pool cooling and cleanup system provides spent fuel storage pool temperature control, maintains spent fuel storage pool water clarity, and minimizes the concentration of spent fuel fission and corrosion products in the spent fuel storage pool.

The spent fuel storage pool is a reinforced concrete structure. It is completely lined with stainless steel, which provides a leak-proof membrane that is resistant to abrasion, corrosion, and damage during normal and refueling operations. The stainless steel liner plates are seam-welded together and anchored to the surrounding concrete. Each liner weld seam is backed up by a drainage monitoring channel.

The refueling canal connecting the spent fuel storage pool to the reactor head cavity is provided with two hydraulic gates, in series, with a monitored drain between them. This arrangement permits monitoring for any leaks and facilitates repair of a gate or seal, if required.

To avoid unintentional draining of the spent fuel storage pool to levels below that required for adequate shielding of spent fuel, no inlets, outlets or drains are provided that permit excessive draining of the pool. Lines extending below the minimum permissible water level are designed to prevent any siphon backflow.

The spent fuel storage racks provide a storage location at the bottom of the spent fuel storage pool for spent fuel assemblies. The racks are full length, top entry type, designed to maintain spent fuel assemblies in a space geometry which precludes the possibility of criticality under normal and abnormal conditions. The spent fuel storage racks are made of aluminum or stainless steel with Boral as a neutron absorber.

The FPCC system cools and purifies the spent fuel storage pool by passing the pool water through two heat exchangers, transferring heat to the reactor building closed loop cooling water system. Water purity and clarity in the spent fuel storage pool, reactor head cavity, and reactor internals storage pit are maintained by filtering and demineralizing the pool water.

Additional capability also exists to add water to the pool through a cross-tie to the RHR system in the event of loss of normal makeup system and when pool water level is threatened due to heavy pool water inventory loss.

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

- Maintain safe level of pool in the event of a line break. This function is performed by the vacuum breakers.
- Provide criticality protection. This function is performed by Boral plates in the pool racks.

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

- Support a secondary means of makeup water to the FPCC system in the event of a loss of water level in the spent fuel pool.
- 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).

UFSAR References

Sections 9.3 and 9.4

Components Subject to Aging Management Review

The spent fuel pool liner, the storage racks that hold the boral neutron absorber, and the fuel pool gates are included in the structural evaluations for the reactor building (Section 2.4.1). Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining FPCC 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-FM-19A

LRA-FM-20A

2.3.3.10 Service, Instrument, and Breathing Air

System Description

The purpose of the service, instrument and breathing air system is to provide a continuous supply of oil-free compressed air. This air is directed to plant breathing air, instrumentation and general plant services.

The compressed air supply to the breathing, instrument and service air subsystems is provided by three air compressors arranged in parallel to discharge air through individual air receivers. The three air receivers have a common discharge header which feeds three instrument air dryers. This common discharge header also supplies air to the breathing air headers and the instrument air headers after passing through two air dryers, which are installed in parallel. Each of the dryers is provided with pre-filters and after-filters to ensure that no particulate matter (dirt or desiccant) enters the system. The breathing air system is provided with a breathing air accumulator.

Instrument air is available as a backup to drywell instrumentation and controls, which are normally supplied with nitrogen via the instrument air line. Using nitrogen ensures that any leakage will not dilute the nitrogen-inerted primary containment. The normal source of nitrogen is the primary containment atmosphere control and dilution system.

The service, instrument and breathing air system has the following intended functions for 10 CFR 54.4(a)(1).

- Support primary containment isolation.
- Provide pneumatic pressure supply to containment components and instruments.

The service, instrument and breathing air system has the following intended function for 10 CFR 54.4(a)(2).

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

The service, instrument and breathing air system has no intended functions for 10 CFR 54.4(a)(3).

UFSAR References

Section 9.11

Components Subject to Aging Management Review

Components and piping with an instrument air system interface in the main steam system (Section 2.3.4.2), automatic depressurization system (Section 2.3.2.3), primary containment atmosphere control and dilution system (Section 2.3.3.8), drywell ventilation system (Section 2.3.3.7), and control rod drive and hydraulic control units systems (Section 2.3.1) are evaluated with the service, instrument and breathing air system.

Instrument air system isolation valves interfacing with the primary containment atmosphere control and dilution system are evaluated with the CP/CAD/PASS system (Section 2.3.3.8). Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14).

Remaining service, instrument, and breathing air system components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-FM-26A
LRA-FM-29A
LRA-FM-39C

2.3.3.11 Reactor Building Closed Loop Cooling Water

System Description

The purpose of the reactor building closed loop cooling water (RBCLCW) system is to provide required cooling to the equipment located in the reactor building during normal plant operations and to provide a barrier between systems containing radioactive fluids and the non-radioactive service water system pumped directly from and to the lake.

The RBCLCW system consists of a normally independent closed loop piping arrangement. The system is normally in operation, providing cooling for nonsafety-related loads in the reactor building and drywell. The RBCLCW system penetrates primary containment in nine locations to provide cooling water to heat loads within the drywell. The RBCLCW system has three centrifugal pumps taking suction from the reactor building cooling water return loop that provide cooling water flow. Service water cools the RBCLCW heat exchangers. A surge tank, located on the suction side of the pumps, accommodates system volume changes, maintains static pressure in the loop, detects gross leaks in the RBCLCW system, and provides a means for adding makeup water. Makeup water to the RBCLCW system from the demineralized water storage tank is supplied by a connection from the demineralized water transfer pump to the surge tank.

During normal plant operations, two pumps are operating. Some equipment cooled by the reactor building closed loop cooling water system is served with a backup supply of cooling water from the emergency service water system through the ESW to RBCLCW cross-tie valves.

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

- Provide a pressure boundary to prevent the diversion of ESW flow from safety-related components.
- Support primary containment isolation.

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

- The RBCLCW system (ESW to RBCLCW cross-tie valves) is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Section 9.5

Components Subject to Aging Management Review

Some RBCLCW components are evaluated with service water systems (Section 2.3.3.2). Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining system components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-FM-15B

LRA-FM-18A

2.3.3.12 Radwaste and Plant Drains

System Description

This evaluation includes the radwaste system and various plant drain systems. Combining similar components from various plant systems into one consolidated review is appropriate, as stated in NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, Section 2.1.3.1.

The purpose of the radwaste system is to collect, treat, and dispose of radioactive and potentially radioactive liquid and solid wastes in a controlled and safe manner.

The liquid radwaste system collects, treats, stores and disposes of radioactive liquid wastes. These wastes are collected in sumps and drain tanks at various locations throughout the plant and then transferred to the appropriate collection tanks in the radioactive waste building prior to treatment, storage and disposal. Processed liquid wastes are either returned to the condensate system or discharged from the plant in a controlled manner. The wastes are collected, treated and disposed of according to their conductivity and/or radioactivity.

The system is divided into several subsystems so that the liquid wastes from various sources can be segregated and processed separately. Cross-connections between the subsystems provide additional flexibility for processing of the wastes by alternate methods.

The system also drains fire suppression water flow in the event of a fire such that the buildup of water will not impact safety-related equipment in the area.

Process solid wastes are collected, dewatered, packaged and stored in shielded compartments prior to offsite shipment. Examples of these solid wastes are filter residue, spent resins, air filters, rags, used clothing, and evaporator bottoms.

Other than components that are part of primary containment penetrations, the radwaste system includes no safety-related components.

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

- Support primary containment isolation.

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

- Provide a drainage flowpath for fire water in the event of a fire.

The purpose of the yard storm drains system is to collect and transfer rain runoff to the storm sewers.

The purpose of the floor and roof drainage system is to collect and remove waste liquids from their points of origin and to transfer them to suitable treatment and/or disposal areas in a controlled manner. The system includes non-radioactive floor and roof drains from all areas of the plant.

The yard storm drains and floor and roof drainage systems have no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The yard storm drains and floor and roof drainage systems have the following intended functions for 10 CFR 54.4(a)(3).

- Provide a drainage flowpath for fire water in the event of a fire (10 CFR 50.48).

UFSAR References

Section 9.13, 11.2, 11.3

Components Subject to Aging Management Review

Mechanical components of the radwaste system primary containment penetrations are evaluated with primary containment penetrations (Section 2.3.2.7). Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14)

Components of these systems used for drainage of fire water 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

Floor drain flow paths from the floor drain to the sump tanks are mostly shown only on plant layout and equipment drawings which are not suitable for LRA drawings. In lieu of LRA drawings, floor drain routing is provided in the table below, which describes floor drain and tanks (sump) discharge flow paths included in this evaluation.

Floor Drains (and Equipment Drains for EDG rooms) Routing Table

Route Number	Description
1	Drainage flows from reactor building drains into the reactor building floor drain sumps (20TK-68A,B). Flow terminates in the radwaste building floor drain collection tank (20TK-28).
2	Drainage flows from drywell drains to the drywell floor drain sump (20TK-104). Flow terminates in the radwaste building floor drain collection tank (20TK-28).
3	Drainage flows from turbine building drains, heater bay drains and electric bay drains into the turbine building floor drain sumps (20TK-103A, B, C). The flow terminates in the radwaste building floor drain collection tank (20TK-28).
4	Drainage flows from the radwaste building drains and the heater bay into the floor drain collection tank. Drainage from the heater bay flows to the radwaste laundry drain tanks (20TK-25 A,B) and then to the radwaste floor drain sump (20TK-218) prior to flow termination at the floor drain collection tank (20TK-28).
5	Drainage flows from the administration building pipe tunnel drains and to the heater bay floor drains EL. 252' and terminates at the radwaste building trench.
6	Drainage starts at the administration building cable tunnel and reactor building (EL. 300', N) and flows to the aux. boiler room, then to the yard fuel oil area and flow terminates in the yard storm drainage system. Drainage flows from the administration building cable tunnel floor drain piping and is connected to the floor drain piping in the cable spreading room prior to connection with the aux. boiler area drainage. Drainage to the intake structure was provided for the cable tunnels under modification F1-92-109.
7	Drainage starts at the administration building (EL. 300') and the battery rooms in the heater bay and flows to the administration building sump where the drainage is pumped to the roof drain piping (EL. 260') of the administration building. This flow terminates in the yard storm drainage system. The floor drain piping for the administration building (EL. 300') is also connected to the drain piping on EL. 272' prior to discharge at the administration building sump.
8	Floor and equipment drainage from the emergency diesel generator building terminates at the yard storm drainage system.

Floor Drains (and Equipment Drains for EDG rooms) Routing Table (Continued)

Route Number	Description
9	Drainage starts at the turbine building electric bay and screenwell building, flows to the screenwell floor drain piping and terminates at the screenwell discharge tunnel. Drainage flow from the electric bay floor drain piping flows to the floor drain piping in the electric and pipe tunnels of the turbine building and then to the TB floor drain sump. Drainage from the sump is pumped to the screenwell floor drain piping.
10	Drainage starts at the screenwell building and flow terminates in the discharge tunnel.
11	Drainage starts at the screenwell building and flows to the screenwell building roof drainage piping or connects to the screenwell floor drain sump where the drainage is pumped to the roof drain piping on EL. 260'.

2.3.3.13 Security Generator

System Description

The purpose of the security system is to provide equipment necessary for maintaining site security. The security system includes the security generator, which provides necessary lighting for certain areas credited in the 10 CFR 50 Appendix R safe shutdown analysis.

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

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

- The security generator is credited in the 10 CFR 50 Appendix R safe shutdown analysis (10 CFR 50.48).

UFSAR References

None

Components Subject to Aging Management Review

Security generator 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

None

2.3.3.14 Miscellaneous Systems in Scope for (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 in physical proximity to a safety-related component.

Functional Failure

Functional failures of nonsafety-related SSCs which could impact a safety function are identified in previous sections of the LRA and are not included in this evaluation.

Physical Failure

This section summarizes the scoping and screening results based on 10 CFR 54.4(a)(2) because of the potential for physical interactions with safety-related equipment.

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

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. Each mechanical system safety-related to nonsafety-related interface was reviewed to identify the components located between the safety-related/nonsafety-related interface and the first equivalent anchor or structural boundary. Systems with such components are included in Table 2.3.3.14-A.

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 Section 2.1.1.2.

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.

Pipe Whip, Jet Impingement, or Harsh Environments

Systems containing nonsafety-related high energy lines that can effect safety-related equipment are included in this review. These systems are included in the system list in Table 2.3.3.14-A.

Leakage or Spray

Nonsafety-related systems and nonsafety-related portions of safety related systems containing 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. These systems are included in the system list in Table 2.3.3.14-A.

The following 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.

Table 2.3.3.14-A
Systems within the Scope of License Renewal based on the Potential for Physical Interaction with Safety-Related Components (10 CFR 54.4(a)(2))

System Code	System Name	Section Describing System
01	Gas Handling	Section 2.3.2.6, Gas Handling (Including Standby Gas Treatment)
02	Reactor Coolant	Section 2.3.1, Reactor Coolant System
03	Control Rod Drive	Section 2.3.1, Reactor Coolant System
10	Residual Heat Removal	Section 2.3.2.1, Residual Heat Removal
11	Standby Liquid Control	Section 2.3.3.1, Standby Liquid Control
12	Reactor Water Cleanup	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
13	Reactor Core Isolation Cooling	Section 2.3.2.5, Reactor Core Isolation Cooling
14	Core Spray	Section 2.3.2.2, Core Spray System
15	Reactor Building Closed Loop Cooling Water	Section 2.3.3.11, Reactor Building Closed Loop Cooling Water
16	Primary Containment	Section 2.3.2.7, Primary Containment Penetrations
17	Process Radiation Monitors	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
19	Fuel Pool Cooling and Cleanup	Section 2.3.3.9, Fuel Pool Cooling and Cleanup
20	Radwaste	Section 2.3.3.12, Radwaste and Plant Drains
23	High Pressure Coolant Injection	Section 2.3.2.4, High Pressure Coolant Injection
27	Containment Purge/CAD/PASS	Section 2.3.3.8, Containment Purge, Containment Atmosphere Dilution, and Post-Accident Sampling
29	Main Steam	Section 2.3.4.2, Main Steam

**Table 2.3.3.14-A (Continued)
Systems within the Scope of License Renewal based on the Potential
for Physical Interaction with Safety-Related Components (10 CFR 54.4(a)(2))**

System Code	System Name	Section Describing System
31	Extraction Steam	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
32	Decay Heat Removal	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
33	Condensate	Section 2.3.4.1, Condensate
34	Feedwater	Section 2.3.4.3, Feedwater
35	Feedwater Heater Vents and Drains	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
36	Circulating Water	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
37	Turbine Building Closed Loop Cooling	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
38	Vacuum Priming and Air Removal	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
39	Service, Instrument, and Breathing Air	Section 2.3.3.10, Service, Instrument, and Breathing Air
40	Turbine Lube Oil	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
41	Secondary Plant Drains	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
42	Raw Water Treatment	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
44	Contaminated Equipment Drains	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
46	Service Water	Section 2.3.3.2, Service Water
63	Auxiliary Gas Treatment	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)

Table 2.3.3.14-A (Continued)
Systems within the Scope of License Renewal based on the Potential for Physical Interaction with Safety-Related Components (10 CFR 54.4(a)(2))

System Code	System Name	Section Describing System
66	Reactor Building Ventilation	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
67	Turbine Building Ventilation	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
68	Drywell Ventilation and Cooling	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
72	Administration Building Ventilation and Cooling	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
73	Screenwell / Water Treatment Ventilation and Cooling	Section 2.3.3.7, Heating, Ventilation and Air Conditioning
74	Plumbing, Sanitary and Lab	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
76	Fire Protection	Section 2.3.3.5, Fire Protection – Water
78	City Water	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
87	Auxiliary Boiler and Accessories	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
93	Emergency Diesel Generator	Section 2.3.3.3, Emergency Diesel Generator
94	Main Turbine Generator	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
95	Sample System	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
96	Steam Seall	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)

System Description

The following systems within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) are not described elsewhere in the application. Each system has the following intended function.

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

Components in these systems supporting this intended function are those nonsafety-related, fluid-filled components located in spaces containing safety-related SSCs. 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 potential interaction between nonsafety-related and safety-related SSCs is limited to the space. Nonsafety-related systems and components that contain water, oil, or steam, and are in spaces with safety-related SSCs are in scope and subject to aging management review under criterion 10 CFR 54.4(a)(2). For a list of these components, see "Components Subject to Aging Management Review" below.

Section 2.3.3.14, Miscellaneous Systems in Scope for 10 CFR 54.4(a)(2), provides the aging management review results for 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., Primary Containment, Section 2.3.2.7, for primary containment penetrations).

Reactor Water Cleanup

The purpose of the reactor water cleanup (RWCU) system is to maintain high reactor water purity to limit chemical and corrosive action, thereby limiting fouling and deposition on heat transfer surfaces. The reactor water cleanup system removes corrosion products to limit impurities available for neutron activation and resultant radiation from deposition of corrosion products. The system also provides a method for decreasing reactor coolant system inventory during heatup.

The RWCU system consists of pumps, regenerative and non-regenerative heat exchangers, and two filter-demineralizers and supporting equipment connected by associated valves and piping. Reactor coolant is removed from the reactor recirculation system, cooled in the regenerative and non-regenerative heat exchangers, filtered and demineralized and returned to the RCS via the feedwater system through the shell side of the regenerative heat exchanger.

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

- Support primary containment isolation.

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

- RWCU is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

The containment isolation valves in the RWCU system, which are also the components credited for fire protection, are evaluated with the reactor coolant pressure boundary in Section 2.3.1.

Extraction Steam

The purpose of the extraction steam (ES) system is to transport steam to components of the steam and power conversion system. The ES system supplies steam from the turbine extraction points to loads such as the feedwater heaters and reactor feed pump turbines. The ES system includes the moisture separator reheaters and the steam reboiler system.

The moisture separator reheaters reduce the moisture content of the exhaust steam from the high pressure turbine before it enters the two low pressure turbines. Steam from the reheaters, along with main steam, supplies the reactor feed pump turbines.

The steam reboiler provides clean steam to the turbine steam seal header. Main steam or turbine extraction steam supplies heat to boil clean condensate in the reboiler.

Decay Heat Removal

The purpose of the decay heat removal (DHR) system is to provide an alternate means of removing decay heat from the spent fuel pool (SFP). The DHR system can also cool the reactor core when the reactor pressure vessel head has been removed, the reactor cavity flooded, and the fuel transfer gates removed, due to the natural convection currents established between the SFP and the reactor cavity.

The DHR system uses primary and secondary cooling loops consisting of two primary loop pumps, two primary loop heat exchangers, two secondary loop pumps, and two sets of secondary loop cooling towers. The primary loop circulates water from the SFP through the heat exchangers and back to the SFP. The secondary loop circulates water between the heat exchangers and cooling towers. The DHR system does not involve physical interfaces with any safety-related systems and interfaces with other plant systems are limited. Permanent connections to the condensate transfer system and the demineralized water system are provided to fill the primary and secondary loops, respectively.

Feedwater Heater Vents and Drains

The purpose of the feedwater heater vents and drains system is to support feedwater heating in the condensate system. The feedwater heater vents and drains system consists of the piping, valves instruments and controls that maintain appropriate shell side levels in the feedwater heaters. Drains cascade from the highest to lowest pressure heater and to the main condenser. Heater vents are also connected to the condenser.

Circulating Water

The purpose of the circulating water (CW) system is to provide the main condenser with a continuous supply of cooling water for removing the heat rejected by the turbine exhaust and turbine bypass steam as well as from other exhausts over the full range of operating loads.

The circulating water system uses water taken from Lake Ontario. Water passes through trash racks and then through traveling water screens. A major portion of the flow is directed to the circulating water pumps which deliver water to the main condenser. A small portion of the water is used by the service water pumps. The discharge from the main condenser and from the service water system is returned via the discharge tunnel and diffuser system to the lake.

Turbine Building Closed Loop Cooling

The purpose of the turbine building closed loop cooling (TBCLC) system is to provide cooling to auxiliary equipment located in the turbine building and in the radioactive waste building. It also provides makeup seal water to the condenser air removal pumps and the condenser water box vacuum priming pumps.

The system consists of a single closed loop with three centrifugal pumps in parallel feeding the shell side of three TBCLC system heat exchangers. Cooling is provided by the normal service water system fed through the tube side of the heat exchanger. The three heat exchangers of the system are arranged in parallel and deliver cooling water to various loads, including the main generator hydrogen coolers, generator stator coolers, turbine lube oil coolers, and several component oil coolers. A surge tank located above the TBCLC pump suction accommodates system volume changes, maintains static head on the pumps, detects gross leaks in the TBCLC system and provides a means for adding makeup water.

Vacuum Priming and Air Removal

The purpose of the vacuum priming and air removal system is to remove all air and non-condensable gases from the condenser. The system also processes turbine gland seal leakoff.

The vacuum priming and air removal system includes a steam jet air ejector unit complete with inter and after-condensers to remove air and non-condensable gases from the main condenser. The air ejector is a two-stage unit complete with pre-cooler, intercondenser, vent cooler, shutoff valves, and after-condenser. Service water is used as the cooling medium for the pre-cooler and vent cooler. The non-condensable gases and entrained vapor from the system are then exhausted to the off gas system.

Two mechanical vacuum pumps, complete with heat exchangers and separator silencers, remove air and non-condensable gases from the main condenser during startup and shutdown when adequate steam pressure is not available to operate the air ejector. The discharge of the mechanical vacuum pumps is routed to the off-gas holdup piping.

The outer ends of all turbine gland seals are routed to the steam packing exhauster, which is maintained at a slight vacuum by the exhaust blowers. The exhaust blowers deliver air and non-condensable gases to the off-gas system. The steam packing exhauster is cooled by main condensate flow after it passes through the air ejector condensers.

In addition to the intended function for 10 CFR 54.4 (a)(2) listed above, the vacuum priming and air removal system has the following intended function for 10 CFR 54.4(a)(2).

- Components of the vacuum priming and air removal system that interface with the SGT system form part of the pressure boundary for that system.

Components that interface with the SGT system are reviewed in Section 2.3.2.6, Gas Handling.

Turbine Lube Oil

The purpose of the turbine lube oil system is to provide clean lubricating oil to the lubrication oil reservoirs of the main turbine generator and the reactor feed pump turbines. Oil for the main generator shaft hydrogen seals is also provided. The turbine lube oil system includes the main turbine oil reservoir, a turbine oil conditioner, clean, dirty, and waste oil storage tanks, and the interconnecting piping, pumps, valves, instrumentation and controls.

Secondary Plant Drains

The purpose of the secondary plant drains system is to provide a drain flowpath from steam and power conversion system components to the main condenser. The system includes piping, valves, instrumentation and controls to handle drainage from various systems including main steam, extraction steam and the vacuum priming and air removal system.

Raw Water Treatment

The purpose of the raw water treatment system is to provide a supply of treated water suitable for plant makeup and other demineralized water requirements.

The raw water treatment system equipment is located in the screenwell area. It is composed of two major groupings of equipment. The front end of the system consists of a standard clarification and filtration train. The latter part of the system includes absorption by activated carbon and deionization in a train of ion exchange beds. The deionization train also includes a unit for dissolved gas removal. A reverse osmosis system is normally used upstream of the deionization train. Input water for the makeup water treatment system may be either service water from Lake Ontario or city water from the Oswego municipal system.

The equipment listed in process sequence includes the service water prefilters, a clarifier, three parallel anthracite filters, a clearwell holdup tank, an activated carbon filter, a reverse osmosis system, a cation exchanger, a vacuum deaerator, an anion exchanger and a mixed bed exchanger. System effluent passes to three 25,000 gallon fiberglass polyester resin demineralizer water storage tanks, from which it is pumped by two demineralized water transfer pumps (one standby) to supply the plant requirements.

Contaminated Equipment Drains

The purpose of contaminated equipment drains system is to collect and transfer waste liquids to suitable treatment and/or disposal areas in a controlled manner. The system consists of piping and components which drain contaminated or potentially contaminated waste from equipment and floor drains to the radioactive waste system for processing.

In addition to the intended function for 10 CFR 54.4 (a)(2) listed above, the contaminated equipment drains system has the following intended function for 10 CFR 54.4(a)(2).

- Components of the contaminated equipment drains system that interface with the SGT system form part of the pressure boundary for that system.

Components that interface with the SGT system are reviewed in Section 2.3.2.6, Gas Handling.

Auxiliary Gas Treatment

The purpose of the auxiliary gas treatment system is to process radioactive gases that accumulate under the reactor vessel head during plant outages to support the reactor vessel head removal. The system can also be used during outages to remove radioactive gasses around contaminated equipment using portable hoses or ducts. A removable duct section is used to connect the reactor vessel head to the auxiliary gas treatment system consisting of a demister, high efficiency filters, charcoal filter, and a fan. The processed gas is then discharged to the reactor building ventilation system exhaust or to the standby gas treatment system.

Plumbing, Sanitary and Lab

The purpose of the plumbing, sanitary and lab system is to provide drinking water supplies and disposal of sanitary wastes during normal plant operation. This system includes the domestic water storage tank, potable water pump and potable water distribution piping, and the shower waste storage tank and pump. This system also includes the laboratory vacuum equipment.

City Water

The purpose of the city water system is to distribute potable water to various locations around the plant site. The system consists of the piping and valves from the Oswego water supply to distribution systems in buildings around the site and to other systems such as the potable water and water treatment systems.

Auxiliary Boiler and Accessories

The purpose of the auxiliary boiler and accessories system, which is comprised of the plant heating system, is to provide heat to the plant building spaces. The plant is heated during planned operation by a forced circulation hot water system for recirculation air heating, and a hot water-ethylene glycol system for heating outside air being introduced into ventilation systems. The plant heating system consists of two package hot water boilers, two hot water circulating pumps, three hot water-glycol circulating pumps, two fuel oil transfer pumps, one 170,000 gallon fuel storage tank, two compression tanks and associated piping, valves, combustion controls, and instrumentation.

Main Turbine Generator

The purpose of the main turbine generator system is to receive steam from the boiling water reactor, economically convert a portion of the thermal energy contained in the steam to electric energy and provide extraction steam for feedwater heating.

The turbine-generator unit consists of the turbine, generator, exciter, controls and required sub-systems. The turbine consists of a double flow high pressure turbine and two double flow low pressure turbines. Exhaust steam from the high pressure turbine passes through moisture separator/reheaters before entering the two low pressure turbines. The separators reduce the moisture content of the steam and the first stage and second stage reheaters superheat the steam. The generator is a direct-coupled, hydrogen cooled, three-phase synchronous generator.

The turbine utilizes an electro-hydraulic control system consisting of conventional governing devices, emergency devices for turbine and plant protection, and special control and test devices. The electro-hydraulic system operates the main stop valves, control valves, bypass valves, crossover combination intercept-intermediate valves, and other protective devices.

Sample System

The purpose of the sample system (SS), excluding the PASS system, is to monitor the operational performance of plant equipment. Samples are taken from various streams and locations. There are two sample sinks, one in the reactor building and one in the radioactive waste building. Most samples are sent to these sinks to facilitate sampling and reduce exposure to plant personnel. Samples are taken to the laboratory for appropriate analysis. In addition, continuous automatic monitoring and alarm of undesirable conditions is provided using in-line detectors when necessary.

Steam Seal

The purpose of the steam seal system is to prevent steam leakage out of, and air leakage into the turbine or condenser. The system consists of the steam seal regulator, steam seal header, and piping to the steam packing exhauster, which is part of the vacuum priming and air removal system. Steam is supplied to the steam seal system from the gland seal reboiler system. Sealing steam is supplied to the sub-atmospheric glands of the low pressure turbine and the reactor feed pump turbine from the steam seal header. The outer ends of all glands are routed to the steam packing exhauster, which is maintained at a slight vacuum by the exhaust blowers.

UFSAR References

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

System	UFSAR Section
Reactor water cleanup	Section 4.9
Extraction steam	Sections 9.18, 10.1, 10.2, and 10.8
Decay heat removal	Section 9.22
Feedwater heater vents and drains	Section 10.8
Circulating water	Section 10.6
Turbine building closed loop cooling	Section 9.6
Vacuum priming and air removal	Section 10.4 (main condenser air removal system)
Turbine lube oil	None
Secondary plant drains	None
Raw water treatment	Section 9.10 (Section 9.10 describes the makeup water treatment system, which is part of the raw water treatment system)
Contaminated equipment drains	Section 9.13
Auxiliary gas treatment	Section 9.9.3.3
Plumbing, sanitary and lab	Section 9.12 (Section 9.12 describes the potable water system, which is part of the plumbing, sanitary and lab system)
City water	None
Auxiliary boiler and accessories	Section 9.9.3.2 (Section 9.9.3.2 describes the plant heating system, which is part of the auxiliary boiler and accessories system)
Main turbine generator	Section 10.2
Sample system	Section 9.14 (Section 9.14 describes the process liquid sampling system, which is part of the sampling system)
Steam seal	Section 10.4 (Section 10.4 describes the turbine gland sealing system, which encompasses the steam seal system)

Components Subject to Aging Management Review

Components located between a safety-related/nonsafety-related interface and the first equivalent anchor or structural boundary are subject to aging management review.

Nonsafety-related components in a system determined to be in scope for 54.4(a)(2) for spatial interaction are subject to aging management review. Components are excluded from review if their location is such that safety-related equipment cannot be impacted by component failure. The following structures and areas contain safety-related SSCs. Nonsafety-related components containing liquid or steam located in these structures or areas are subject to aging management review.

- battery rooms
- cable spreading room
- control room
- control and relay room HVAC ventilation room
- diesel generator building and associated switchgear rooms
- east and west cable tunnels
- electric bays
- main stack
- primary containment structure (including drywell, suppression chamber, vent pipes and penetrations)
- reactor building
- relay room
- screenwell-pumphouse (substructure)
- service water pump house (emergency service pump rooms)
- standby gas treatment building
- administration building
- CAD building
- portions of the turbine building
- east pipe tunnel
- north and south cable tunnels
- MG set room

Series 2.3.3-14-xx tables list the component types that require aging management review for 10 CFR 54.4(a)(2) based on potential for physical interactions.

Series 3.3.2-14-xx tables provide the results of the aging management review for 10 CFR 54.4(a)(2) based on potential for physical interactions.

Table 2.3.3.14-B
10 CFR 54.4(a)(2) Aging Management Review Tables

System Name	Series 2.3.3-14-xx Table	Series 3.3.2-14-xx Table
Gas Handling	Table 2.3.3-14-1	Table 3.3.2-14-1
Reactor Coolant	Table 2.3.3-14-2	Table 3.3.2-14-2
Control Rod Drive	Table 2.3.3-14-3	Table 3.3.2-14-3
Residual Heat Removal	Table 2.3.3-14-4	Table 3.3.2-14-4
Standby Liquid Control	Table 2.3.3-14-5	Table 3.3.2-14-5
Reactor Water Cleanup	Table 2.3.3-14-6	Table 3.3.2-14-6
Reactor Core Isolation Cooling	Table 2.3.3-14-7	Table 3.3.2-14-7
Core Spray	Table 2.3.3-14-8	Table 3.3.2-14-8
Reactor Building Closed Loop Cooling Water	Table 2.3.3-14-9	Table 3.3.2-14-9
Primary Containment	Table 2.3.3-14-10	Table 3.3.2-14-10
Process Radiation Monitors	Table 2.3.3-14-11	Table 3.3.2-14-11
Fuel Pool Cooling and Cleanup	Table 2.3.3-14-12	Table 3.3.2-14-12
Radwaste	Table 2.3.3-14-13	Table 3.3.2-14-13
High Pressure Coolant Injection	Table 2.3.3-14-14	Table 3.3.2-14-14
Containment Purge/CAD/PASS	Table 2.3.3-14-15	Table 3.3.2-14-15
Main Steam	Table 2.3.3-14-16	Table 3.3.2-14-16
Extraction Steam	Table 2.3.3-14-17	Table 3.3.2-14-17
Decay Heat Removal	Table 2.3.3-14-18	Table 3.3.2-14-18
Condensate	Table 2.3.3-14-19	Table 3.3.2-14-19
Feedwater	Table 2.3.3-14-20	Table 3.3.2-14-20
Feedwater Heater Vents and Drains	Table 2.3.3-14-21	Table 3.3.2-14-21
Circulating Water	Table 2.3.3-14-22	Table 3.3.2-14-22

Table 2.3.3.14-B
10 CFR 54.4(a)(2) Aging Management Review Tables (Continued)

System Name	Series 2.3.3-14-xx Table	Series 3.3.2-14-xx Table
Turbine Building Closed Loop Cooling	Table 2.3.3-14-23	Table 3.3.2-14-23
Vacuum Priming and Air Removal	Table 2.3.3-14-24	Table 3.3.2-14-24
Service, Instrument, and Breathing Air	Table 2.3.3-14-25	Table 3.3.2-14-25
Turbine Lube Oil	Table 2.3.3-14-26	Table 3.3.2-14-26
Secondary Plant Drains	Table 2.3.3-14-27	Table 3.3.2-14-27
Raw Water Treatment	Table 2.3.3-14-28	Table 3.3.2-14-28
Contaminated Equipment Drains	Table 2.3.3-14-29	Table 3.3.2-14-29
Service Water	Table 2.3.3-14-30	Table 3.3.2-14-30
Auxiliary Gas Treatment	Table 2.3.3-14-31	Table 3.3.2-14-31
Reactor Building Ventilation	Table 2.3.3-14-32	Table 3.3.2-14-32
Turbine Building Ventilation	Table 2.3.3-14-33	Table 3.3.2-14-33
Drywell Ventilation and Cooling	Table 2.3.3-14-34	Table 3.3.2-14-34
Administration Building Ventilation and Cooling	Table 2.3.3-14-35	Table 3.3.2-14-35
Screenwell / Water Treatment Ventilation and Cooling	Table 2.3.3-14-36	Table 3.3.2-14-36
Plumbing, Sanitary and Lab	Table 2.3.3-14-37	Table 3.3.2-14-37
Fire Protection	Table 2.3.3-14-38	Table 3.3.2-14-38
City Water	Table 2.3.3-14-39	Table 3.3.2-14-39
Auxiliary Boiler and Accessories	Table 2.3.3-14-40	Table 3.3.2-14-40
Emergency Diesel Generator	Table 2.3.3-14-41	Table 3.3.2-14-41
Main Turbine Generator	Table 2.3.3-14-42	Table 3.3.2-14-42
Sample System	Table 2.3.3-14-43	Table 3.3.2-14-43
Steam Seal	Table 2.3.3-14-44	Table 3.3.2-14-44

License Renewal Drawings

None. The determination of whether a component meets the 10 CFR 54.4(a)(2) scoping criterion is based on where structural/seismic boundaries exist, or where the component is located in a building, whether it contains gas or liquid, and its proximity to safety-related equipment. A conservative spaces approach for scoping in accordance with 10 CFR 54.4(a)(2) included almost all mechanical systems within the scope of license renewal (see Table 2.3.3.14-A). Providing drawings highlighting in-scope (a)(2) components would not provide significant additional information since the drawings do not indicate proximity of components to safety-related equipment and do not identify structural/seismic boundaries.

Table 2.3.3-1
Standby Liquid Control System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Accumulator	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

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

Component Type	Intended Function(s)
Bolting	Pressure boundary
Flow element	Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-3
Emergency Diesel Generator System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Duct	Pressure boundary
Duct flexible connection	Pressure boundary
Expansion joint	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (housing)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Heater housing	Pressure boundary
Lubricator housing	Pressure boundary
Motor housing	Pressure boundary
Muffler	Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary

**Table 2.3.3-3
Emergency Diesel Generator System
Components Subject to Aging Management Review
(Continued)**

Component Type	Intended Function(s)
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-4
Fuel Oil System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Flame arrestor	Flow control
Flow meter housing	Pressure boundary
Injector housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	*Filtration*
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-5
Fire Protection – Water System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Filter housing	Pressure boundary
Gear box housing	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube)	Heat transfer Pressure boundary
Heater housing	Pressure boundary
Muffler	Pressure boundary
Nozzle	Flow control Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Turbocharger housing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-6
Fire Protection – CO_2 System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Coil	Pressure boundary
Nozzle	Pressure boundary
Piping	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

**Table 2.3.3-7
Heating, Ventilation and Air Conditioning Systems
Components Subject to Aging Management Review**

Component Type	Intended Function(s)
Bolting	Pressure boundary
Compressor housing	Pressure boundary
Damper housing	Pressure boundary
Duct	Pressure boundary
Duct flexible connection	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Flow element	Flow control Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (housing)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Heat exchanger (tubesheet)	Pressure boundary
Louver housing	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer	Filtration

Table 2.3.3-7
Heating, Ventilation and Air Conditioning Systems
Components Subject to Aging Management Review
(Continued)

Component Type	Intended Function(s)
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-8
Containment Purge, CAD, PASS System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (coil)	Heat transfer Pressure boundary
Heater housing	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sample trap	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-9
Fuel Pool Cooling and Cleanup System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Diffuser	Flow control
Neutron absorber	Neutron absorption
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-10
Service, Instrument, and Breathing Air Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Piping	Pressure boundary
Quick connect	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-11
Reactor Building Closed Loop Cooling Water System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Accumulator	Pressure boundary
Bolting	Pressure boundary
Orifice	Flow control
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-12
Radwaste and Plant Drains Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tank	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-13
Security Generator System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Piping	Pressure boundary
Pump casing	Pressure boundary
Silencer	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-14-1
Gas Handling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-2
Reactor Coolant System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
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
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-3
Control Rod Drive System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
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
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-4
Residual Heat Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Steam trap	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-5
Standby Liquid Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	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

1. 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 2.3.3-14-6
Reactor Water Cleanup System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Demineralizer	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-7
Reactor Core Isolation Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Rupture disk	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-8
Core Spray System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-9
Reactor Building Closed Loop Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
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
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-10
Primary Containment System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-11
Process Radiation Monitors
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-12
Fuel Pool Cooling and Cleanup System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Flow element	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

1. 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 2.3.3-14-13
Radwaste System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Steam trap	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-14
High Pressure Coolant Injection System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Steam trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-15
Containment Purge/CAD/PASS System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Heat exchanger (tubes)	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-16
Main Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-17
Extraction Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-18
Decay Heat Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-19
Condensate System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function[1]
Bolting	Pressure boundary
Flow element	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

1. 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 2.3.3-14-20
Feedwater System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-21
Feedwater Heater Vents and Drains System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-22
Circulating Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-23
Turbine Building Closed Loop Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-24
Vacuum Priming and Air Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-25
Service/Instrument/Breathing Air System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-26
Turbine Lube Oil System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	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

1. 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 2.3.3-14-27
Secondary Plant Drains
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-28
Raw Water Treatment System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Filter housing	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

1. 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 2.3.3-14-29
Contaminated Equipment Drains
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-30
Service Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-31
Auxiliary Gas Treatment System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Damper housing	Pressure boundary
Duct	Pressure boundary

1. 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 2.3.3-14-32
Reactor Building Ventilation System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Duct	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (tubes)	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-33
Turbine Building Ventilation System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function[1]
Bolting	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (tubes)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-34
Drywell Ventilation and Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Heat exchanger (tubes)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary

1. 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 2.3.3-14-35
Administration Building Ventilation and Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (tubes)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-36
Screenwell/Water Treatment Ventilation and Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Heat exchanger (tubes)	Pressure boundary

1. 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 2.3.3-14-37
Plumbing, Sanitary, and Lab
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-38
Fire Protection System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-39
City Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-40
Auxiliary Boiler and Accessories
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-41
Emergency Diesel Generator
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Compressor housing	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-42
Main Turbine Generator
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Filter housing	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
Thermowell	Pressure boundary
Tubing	Pressure boundary
Turbine casing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-43
Sample System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Heat exchanger (tubes)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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 2.3.3-14-44
Steam Seal System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. 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.

- condensate
- main steam
- feedwater

2.3.4.1 Condensate

System Description

The purpose of the condensate system, in conjunction with the feedwater system, is to provide a dependable supply of feedwater to the reactor and to provide feedwater heating. The condensate tanks provide the preferred supply of water to the HPCI and RCIC systems.

The condensate system includes main condensers, condensate pumps, condensate demineralizers, condensate booster pumps, feedwater heaters, condensate storage tanks, and condensate transfer pumps.

Three motor-driven condensate pumps, arranged in parallel, take suction from the condenser hotwells and discharge through the air ejector condensers, gland seal condenser, recombiner condenser, and condensate demineralizers to the condensate booster pump suction header. Three motor-driven condensate booster pumps, arranged in parallel, take suction from the condensate booster pump suction header and discharge into two parallel strings of feedwater heaters, each consisting of one drain cooler and five low pressure feedwater heaters. The last low pressure, or fifth point, feedwater heaters provide suction to the reactor feedwater pumps, which are part of the feedwater system. The reactor feedwater pumps discharge to the sixth point high pressure feedwater heaters, which are again part of the condensate system. The remaining flowpath downstream of the sixth point feedwater heater into the reactor is part of the feedwater system.

Condensate demineralizers maintain the required purity of feedwater to the reactor. Suspended and dissolved solids, fission and activation products, and corrosion products are removed. The full flow, deep bed condensate demineralizer system consists of eight mixed bed ion exchangers (one spare) and an external chemical regeneration facility.

The condensate storage tanks provide plant system makeup, receive system reject flow and provide condensate for any continuous service needs and intermittent batch type services, including suppression pool makeup. Two condensate transfer pumps supply condensate to various loads. Suction connections for these loads to the condensate storage tanks are located above the HPCI and RCIC suctions to provide a 100,000-gallon reserve in each tank for the ECCS. The lower half of each tank is located below ground level for tornado and seismic protection of the 100,000-gallon reserve storage capacity. The condensate tanks provide the preferred supply of water to the HPCI and RCIC systems, while torus water storage provides a safety-related backup water supply.

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

- Support primary containment isolation.
- Support the automatic transfer of HPCI and RCIC pump suction from the condensate storage tanks to the suppression pool on low water level in the condensate storage tanks (performed by instrumentation lines).

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

- Provide the preferred source of water to the HPCI and RCIC systems.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

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

- The condensate system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).
- Provide makeup water to the reactor vessel during a station blackout (10 CFR 50.63).

UFSAR References

Sections 10.3, 10.7, 10.8 and 10.9

Components Subject to Aging Management Review

Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14). Remaining condensate system 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-FM-33D

LRA-FM-22A

LRA-FM-25A

2.3.4.2 Main Steam

System Description

The purpose of the main steam (MS) system is to carry steam from the reactor vessel through the primary containment to the main steam turbine. The main steam system also supplies steam to the HPCI and RCIC turbines when required. The purpose of the main steam leak collection system (MSLCS) is to collect and process leakage across the seats of the main steam isolation valves (MSIVs) and to collect and process stem packing leakage from the MSIVs outside containment following a design basis LOCA.

Four steam lines are utilized between the reactor and the turbine. Two isolation valves are provided in series in a horizontal run of each main steam line, as close as practical to the primary containment, one inside (inboard) and the other outside (outboard). The valves, when closed, form part of the primary containment barrier for reactor coolant system breaks inside the containment and part of the reactor coolant pressure boundary for main steam line breaks outside the primary containment. Steam is extracted from a main steam header upstream of the main steam line isolation valves to drive the HPCI and RCIC turbines. The four steam lines connect through a bypass valve chest upstream of the turbine stop valves. Drain lines are connected to the low points of each main steam line inside and outside the drywell.

The main steam leak collection system monitors and routes the non-condensables of the packing gland leak off of outboard MSIVs to the standby gas treatment system. The effluent of the MSLCS is processed by the SGT system and is exhausted through the stack.

Nitrogen is supplied to the MSIVs inside the primary containment to prevent adding oxygen to the inerted atmosphere. The nitrogen supply lines to the valves are part of the main steam system.

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

- Support isolation of the main steam isolation valves and main steam line drain valves.
- Provide steam to HPCI turbine.
- Maintain integrity of reactor coolant pressure boundary up to and including the downstream main steam isolation valve.
- Provide main steam line isolation valve leakage collection and release.
- Support isolation of MSLCS isolation valves.
- Maintain the N2 pressure boundary in containment.
- Maintain the boundary between the reactor cavity and the main steam lines during refueling, testing and maintenance activities.

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

- Nonsafety-related main steam line piping downstream of the MSIVs supports the operation of the MSLCS.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

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

- The MS system is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).
- Provide steam to the HPCI and RCIC turbines during a station blackout (10 CFR 50.63).

UFSAR References

Sections 4.6, 4.11, 6.4.1, 9.19, and 10.5 (Section 10.5 addresses the turbine bypass system, which is part of the main steam system.)

Components Subject to Aging Management Review

MSIV air accumulators and related components are evaluated with the instrument air system (Section 2.3.3.10). Components supporting main steam line isolation valve leakage collection are evaluated with the standby gas treatment system (Section 2.3.2.6). Components associated with the reactor coolant pressure boundary are evaluated in Section 2.3.1. Nonsafety-related portions that have the potential based on physical interaction to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14).

License Renewal Drawings

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

2.3.4.3 Feedwater

System Description

The purpose of the feedwater system, in conjunction with the condensate system, is to provide a dependable supply of feedwater to the reactor and to provide feedwater heating.

Two, one-half capacity turbine-driven reactor feed pumps, arranged in parallel, take suction from the fifth point feedwater heaters (part of the condensate system) and discharge to the sixth point high pressure feedwater heaters (again part of the condensate system). Piping downstream of the sixth point feedwater heaters is part of the feedwater system, and includes instrumentation and controls, containment isolation (non-return) valves and distribution piping within the drywell to the reactor vessel. Recirculation lines located at the discharge of each pump are provided to prevent overheating during minimum flow, and a feedwater recirculation line downstream of the feedwater heaters returns feedwater to the condenser during startup.

The feedwater system includes the zinc injection system. The purpose of the zinc injection system is to reduce the levels of radiation in the reactor coolant system through addition of small amounts of ionic zinc. The addition of ionic zinc reduces hot spots and post-shutdown radiation levels due to reduced cobalt activation. The system consists of skid mounted injection equipment connected to the reactor feedwater pump piping by a bypass recirculation loop around the feedwater pumps.

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

- Maintain integrity of the reactor coolant pressure boundary
- Support primary containment isolation.

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

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

The feedwater system has no intended function for 10 CFR 54.4(a)(3).

UFSAR References

Sections 9.21, 10.8

Components Subject to Aging Management Review

Components associated with the reactor coolant pressure boundary are evaluated in Section 2.3.1. Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.14).

License Renewal Drawings

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

Table 2.3.4-1
Condensate System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Piping	Pressure boundary
Screen	Filtration
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

Structures and structural components within the scope of license renewal are the reactor building and primary containment (Section 2.4.1), water control structures (Section 2.4.2), the turbine building complex and yard structures (Section 2.4.3), and bulk commodities (piping and conduit supports, electrical cabinets, tank foundations, etc.) (Section 2.4.4).

2.4.1 Reactor Building and Primary Containment

Description

The reactor building houses the primary containment structure. This section includes both structures.

Reactor Building

The purpose of the reactor building is to surround primary containment to provide secondary containment. The reactor building totally encloses primary containment, the refueling and reactor servicing areas, the new and spent fuel storage facilities, and other reactor auxiliary systems. The reactor building serves as containment during reactor refueling and maintenance operations when primary containment is open and as an additional barrier when primary containment is functional.

The reactor building structure is seismic Class I, constructed of monolithic reinforced concrete floors and walls to the refueling level. A reinforced concrete mat placed in an excavation cut out of bedrock supports the reactor building structure, preventing settlement of the structure. The reactor building structural steel includes floor framing steel for platforms inside the drywell and suppression chamber.

A biological shield wall, an integral part of the reactor building, surrounds primary containment. Above the refueling level, the exterior walls consist of steel framing covered by insulated metal siding with sealed joints and insulated steel roof decking. The reactor building crane is equipped with hold-down devices to prevent its being displaced from the rails and falling from the supporting structure. All elevated floors are reinforced concrete framing supported by the exterior walls, the biological shield wall and concrete columns bearing on large supporting beams that span the torus. Interior walls are reinforced concrete or concrete block. Exterior walls below the refuel floor provide radiation shielding and tornado protection for equipment.

The reinforced concrete biological shield wall has a bedrock foundation and serves as the basic biological shield for the reactor building. This shield wall also protects primary containment against potential external missiles.

The new fuel storage vault located in the reactor building is seismic Class I and houses the new fuel storage racks. The new fuel storage rack consists of structural aluminum framing and is seismic Class I.

The spent fuel storage pool in the reactor building is a seismic Class I structure consisting of reinforced concrete lined with stainless steel plate. The pool liner is seam-welded stainless steel with pipe sleeves welded to the liner plate on both sides of the plate. Test channels over the welded joints of the pool liner allow monitoring of the liners for potential leaks.

The seismic Class I refueling bridge is the principal means of transporting fuel assemblies back and forth between the reactor cavity and the spent fuel storage pool. The steel platform travels on tracks along each side of the reactor cavity and spent fuel storage pool.

The reactor 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 reactor building houses equipment credited for anticipated transients without scram (10 CFR 50.62), in the Appendix R safe shutdown analysis and for fire protection (10 CFR 50.48), and for station blackout (10 CFR 50.63).
- Provide radiation-shielding barriers to offsite radiation exposure.
- Provide secondary containment to limit the release of radioactive materials so that offsite doses from a postulated design basis accident are below the guideline values of 10 CFR 100.
- Provide primary containment 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.
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

The reactor building includes the reactor track bay (or railroad and truck port building).

The purpose of the reactor track bay (also known as the secondary containment access lock for equipment) is to provide a protected secondary containment access point for large equipment. The secondary containment access doors are included in this structure. This structure is attached to the reactor building and is not described as a separate building in the UFSAR except for the designation on UFSAR Figure 12.1-2.

The reactor track bay has the following intended functions for 10CFR54.4(a)(1).

- Provide shelter, support and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal.
- Provide secondary containment.

The reactor track bay has no intended functions for 10CFR54.4(a)(2) or (a)(3).

<u>Primary Containment</u>

The purpose of primary containment, in conjunction with other engineered safeguards, is to limit the release of fission products in the event of a postulated design basis accident so that offsite doses do not exceed the guideline values of 10 CFR 100. Primary containment is a Mark I low-leakage pressure suppression containment housing the reactor vessel, the reactor recirculation loops, and other branch connections of the reactor coolant system.

Major components of primary containment include a drywell (housing the reactor vessel) and a pressure suppression chamber (or torus), and the connecting vent system between the drywell and torus. The drywell surrounds the reactor vessel and is connected to the reactor building along its lower portion and laterally supported by the building along its upper portion.

Drywell

The drywell is a carbon steel structure enclosed in reinforced concrete for shielding. It houses the reactor vessel and its associated components. A reinforced concrete structure, founded on bedrock, is an integral part of the drywell support system. Internal structures consist of a drywell fill slab, reactor pedestal, primary shield wall and its lateral support, and structural steel. The reinforced concrete fill slab in the bottom of the drywell supports the reactor pedestal and other structures and components inside the drywell. The reactor pedestal is a reinforced concrete cylinder supporting the reactor vessel, the primary shield wall, and floor framing. When operating at power, the drywell is filled with nitrogen to minimize the availability of oxygen.

Torus

The torus (suppression chamber), a toroidal structure containing demineralized water, is located below the drywell. The torus is a carbon steel pressure vessel anchored to and supported by the reinforced concrete foundation slab of the reactor building. A vent system connects the drywell to the torus with vent lines that terminate below the torus water surface.

Inner Refueling Bellows and Bulkhead Assembly

The inner refueling bellows seal between the reactor vessel flange and the surrounding drywell to permit flooding the space above the vessel during refueling. The refueling bellows consist of a stainless steel bellows, backing plates, a spring seal and removable guard rings. The backing plate surrounds the bellows outer circumference for protection and is equipped with a tap for testing and monitoring leakage. A self-energizing spring seal is between the refueling bulkhead and the backing plate. The guard ring attaches to the assembly and protects the bellows inner circumference. The assembly is welded to the reactor bellows support skirt and the drywell inner refueling seal support ring (bulkhead plate). The reactor bellows support skirt is welded to the reactor vessel flange and the reactor cavity seal bulkhead plate bridges the distance to the primary containment drywell wall. Watertight hinged covers are bolted in place before beginning refueling operation. For normal operation, these covers are removed. The drywell to reactor building bellows assembly is similar to the reactor vessel bellows assembly.

Primary Shield Wall

The primary shield wall (also known as sacrificial shield wall) attenuates neutron and gamma radiation from the reactor to allow access and maintenance of the drywell and to limit damage from radiation exposure to area components. The primary shield wall is a high-density concrete cylinder surrounding the vessel. Inner and outer steel liner plates encapsulate the concrete. The primary shield wall provides lateral support for the reactor vessel to accommodate both seismic forces and jet forces resulting from the breakage of any pipe attached to the reactor vessel. Stabilizers provide lateral support for the primary shield wall. The stabilizers consist of steel pipes welded to the top of the primary shield wall and bolted to fittings on the primary containment wall (drywell shell). Hinged steel shielding doors located on the primary shield wall provide access to the reactor vessel penetrations.

Primary containment has the following intended functions for 10 CFR 54.4(a)(1), (a)(2) and (a)(3).

- Limit the release of fission products in the event of a postulated design basis accident so that offsite doses do not exceed the guideline values of 10 CFR 100.
- Provide support and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. Primary containment houses equipment credited for anticipated transients without scram (10 CFR 50.62), in the Appendix R safe shutdown analysis and for fire protection (10 CFR 50.48), and for station blackout (10 CFR 50.63).
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

UFSAR References

Sections 5.1.2, 5.1.3, 5.2, 5.3, 12.3.1, 12.4.5

Figures 5.2-1, 12.1-2, 12.3-1 to 12.3-10

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect plant equipment including system components, piping, and electrical conductors. Structural commodities that are unique to the reactor building and primary containment are included in this review. Those that are common to JAFNPP in-scope systems and structures (i.e., anchors, embedments, equipment supports, instrument panels, racks, cable trays, and conduits) are reviewed with the bulk commodities (Section 2.4.4).

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 following structures are included in this evaluation.

- intake structure
- intake tunnel
- screenwell-pumphouse structure
- discharge tunnel

Intake Structure

The intake structure provides protection to the inlet of the circulating water intake tunnel and assures a clear flow path for cooling water into the tunnel. The reinforced concrete intake structure sits on the lake bottom approximately 900 feet from the shoreline. Post-tensioned tendons anchor the main structure to the natural bedrock below the lake bottom. A fan-shaped intake, located on the shoreward side of the main structure, is constructed of precast concrete sections and anchored to the bedrock with grouted rock bolts (anchorages or embedments). Bar racks at the intake area prevent entrance of large debris.

The seismic Class I intake tunnel connects to the intake structure and extends with a slight downward slope toward the screenwell-pumphouse structure. Mortared and grouted rock bolts reinforce the tunnel arch. Reinforced concrete invert paving and wire mesh reinforced gunite line the sidewalls and arch. The transition sections, elbow and vertical shafts, have a reinforced concrete lining.

The intake structure has the following intended functions for 10 CFR 54.4(a)(1), (a)(2) and (a)(3).

- Provide a flowpath for cooling water between the lake and the intake tunnel for all safety-related and nonsafety-related cooling water systems.
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

Intake Tunnel

The circulating water intake tunnel provides a flowpath for cooling water from the intake structure to the screenwell - pumphouse structure.

The seismic Class I intake tunnel connects to the bottom of the intake structure and extends downward into the natural rock with a slight downward slope toward the screenwell-pump house structure. Mortared and grouted rock bolts reinforce the tunnel arch. Reinforced concrete invert paving and wire mesh reinforced gunite line the sidewalls and arch. The transition sections, elbow and vertical shafts, have a reinforced concrete lining.

The intake tunnel has the following intended function for 10 CFR 54.4(a)(1) and (a)(3).

- Provide a flowpath for cooling water from the intake structure to the screenwell-pumphouse structure for all safety-related and nonsafety-related cooling water systems.

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

Screenwell-Pumphouse

The screenwell-pumphouse houses the condenser circulating water pumps, normal service water pumps, emergency service water pumps, residual heat removal service water pumps, fire protection system supply pumps, and water treatment tanks and equipment. It is a seismic Class I reinforced concrete structure below grade with a seismic Class II upper superstructure of structural steel framing with insulated metal siding and metal roof deck with insulation and built-up roofing.

Circulating water flows into a large forebay area from the underground intake canal. Trash racks, with a movable rake, and traveling screens filter the water before it passes to individual pump bays. Circulating water is pumped to the main condenser in the turbine building through a steel tube encased in reinforced concrete and is returned to the discharge side of the screenwell-pumphouse through a reinforced concrete tunnel. The structure has divided bays which allow control of water flow with various gates. Interior walls of reinforced concrete and concrete block provide separation for redundant components, providing shielding and tornado protection. The structure is equipped with overhead cranes to service equipment. The building includes concrete floor slabs, structural steel floors, and platforms. Concrete and structural steel columns from the screenwell-pumphouse structure base slab and walls provide support.

The screenwell-pumphouse 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 screenwell - pumphouse building houses equipment 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.

Discharge Tunnel

The circulating water discharge tunnel provides a return flowpath of cooling water from the screenwell - pumphouse to the lake. The failure of this seismic Class II structure could impact the proper operation of the emergency service water system.

The discharge tunnel starts at the screenwell-pumphouse structure and extends northward to the junction with the diffuser branch tunnels which are oriented generally parallel to the shoreline. The alignment of the discharge tunnel with the diffuser branch tunnels produces an equal division of flow. The construction is similar to the intake tunnel.

The discharge tunnel has the following intended function for 10 CFR 54.4(a)(2).

- Provide a flowpath for cooling water from the screenwell - pumphouse building to the lake.

The discharge tunnel has no intended functions for 10 CFR 54.4(a)(1) or (a)(3).

UFSAR References

Sections 12.3.7 (intake structure, intake tunnel, discharge tunnel); 12.2.2 and 12.3.6 (screenwell-pumphouse)

Figures 12.3-26, 12.3-27 (intake structure); 12.1-2, 12.3-26 (intake tunnel and discharge tunnel); 12.1-2, 12.3-23, 12.3-24, 12.3-25 (screenwell-pumphouse)

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 JAFNPP in-scope systems and structures (i.e., anchors, embedments, equipment supports, instrument panels, racks, cable trays, and conduits) are reviewed with the bulk commodities (Section 2.4.4).

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 Complex and Yard Structures

Description

The following structures are included in this evaluation.

- Administration and Control Room Building (ADMIN)
- Condensate Storage Tanks (CST) Foundation and Retaining Wall
- Electric Bay (EBAY)
- Emergency Diesel Generator Building (EDG)
- Main Stack
- Manholes and Duct Banks
- Nitrogen (CAD) Building
- Radioactive Waste Building (RW)
- Security Building
- Standby Gas Treatment (SGT) Building
- Transformer/Switchyard Support Structures
- Transmission Tower (SBO Recovery Path) and Foundation
- Turbine Building (TB), including Feedwater Heater Bay (HBAY)

The turbine building complex and yard structures are designated as seismic Class I, seismic Class II, or non-seismic based on design requirements. Concrete floor slabs, structural steel floors, and platforms are provided inside these facilities. Concrete or structural steel columns, supported by their base slab and walls, provide support for these structures.

Administration and Control Room Building (ADMIN)

The administration building houses the offices and work areas of the plant operating personnel and is situated between the reactor building and turbine building. Included in this structure is the control room for operating all facilities of the plant except the radioactive waste system and the water treatment system. Also included in this structure is the relay room, cable spreading room, battery rooms, and control and relay room HVAC room.

The administration building is primarily a seismic Class II structure; however, it houses the control room, relay room, cable spreading room, switchgear room, battery rooms, control and relay room HVAC room, cable tunnel (includes admin cable tunnel), and pipe tunnel, which are seismic Class I structures. The building is a reinforced concrete structure with foundations on bedrock, and the Class I structures share the same reinforced concrete foundation. The floors and roof are constructed of reinforced concrete supported on steel framing. Those portions of the roof not made of reinforced concrete are made of metal deck. All roofs are furnished with insulation and built-up roofing. The interior walls of the building are reinforced concrete and concrete block. The common wall between the administration building and the turbine building is reinforced concrete. The floors and walls of the administration building adjacent to the reactor building are separated from the reactor building.

The ADMIN structure 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 administration building houses equipment 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.

Condensate Storage Tanks (CST) Foundation and Retaining Wall

The condensate storage tanks foundation and retaining wall support and protect the condensate storage tanks and associated equipment. The two condensate storage tanks rest on reinforced concrete foundations. The lower half of each stainless steel tank is located below ground level for tornado and seismic protection and is protected from collapse of the surrounding soil by a circular, reinforced concrete retaining wall. A reinforced concrete shield wall borders the CST area to the north, west and south of the tanks, providing radiation shielding for personnel protection.

The CST foundation 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 condensate storage tanks foundation and retaining wall support equipment (condensate storage tanks) credited in the Appendix R safe shutdown analysis, and for station blackout (10 CFR 50.63).
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

Electric Bay (EBAY)

The electric bay, which houses various motor-generator sets and both 4160 V and 600 V switchgear, is an integral part of the turbine building. The east and west cable tunnels are under the electric bays and provide separated routing for redundant electrical and control services. The electric bays and cable tunnels are seismic Class I reinforced concrete structures with a reinforced concrete roof supported on structural steel framing. The roof and exterior walls protect the interior equipment from tornado damage.

The EBAY 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 electric bays house equipment credited in the Appendix R safe shutdown analysis, and for fire protection (10CFR50.48).

- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

Emergency Diesel Generator Building (EDG)

The diesel generator building houses four emergency diesel generators. It is a one-story reinforced concrete structure with a concrete roof supported by structural steel. The four emergency diesel generator foundations are of reinforced concrete isolated from the remainder of the structure. Reinforced concrete or concrete block walls separate each diesel generator unit from the adjacent diesel generator unit. Building construction is to seismic Class I and tornado protection design criteria. Each diesel generator unit has its own independent fuel oil system consisting of a main fuel storage tank, a day tank and pumps. The main tanks are buried below the subgrade and anchored to the existing rock 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 (10CFR50.48).
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

Main Stack

The main stack is an unlined, free-standing, seismic Class I reinforced concrete structure founded on a reinforced concrete mat anchored to bedrock with grouted reinforcing rods. The stack sits on a circular filter room of reinforced concrete that houses dilution fans, off-gas filters, and monitoring equipment.

The stack equipment system has the following intended functions for 10 CFR 54.4(a)(1) and (a)(2).

- Provide an elevated release point for discharge of the standby gas treatment system.
- 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.

The stack equipment system has no intended function for 10 CFR 54.4(a)(3).

Manholes and Duct Banks

Manholes and duct banks exist in the JAFNPP yard to allow underground routing of cables and piping. These structural components are of reinforced and non-reinforced concrete construction.

These structures have the following intended functions for 10 CFR 54.4(a)(1) and (a)(2).

- 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.

These structures have no intended functions for 10 CFR 54.4(a)(3).

Nitrogen (CAD) Building

The seismic Class II nitrogen storage (or containment air dilution (CAD)) building houses CAD system equipment including liquid nitrogen storage tanks. The building is located at the south end of the reactor building and consists of reinforced concrete walls on the north and east side and floor. The remaining construction is steel frame construction with metal siding. The roof is constructed of metal decking, insulation, and built-up roofing.

The CAD building 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.
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.
- The nitrogen storage building is credited for fire protection (10 CFR 50.48).

Radioactive Waste Building (RW)

The radioactive waste building houses the equipment to handle the radioactive liquid and solid wastes from the reactor building and turbine building equipment. The seismic Class II building is located east of the water treating building. It contains no safety-related equipment.

The building is a reinforced concrete structure founded on bedrock. A heavy polyvinyl/chloride membrane is placed under the structural base slab and extends to the construction joint between the slab and the exterior walls. This membrane serves as a barrier to prevent the leakage of any radioactive materials into the groundwater. The structural slab and the membrane are constructed on a porous concrete slab which allows the groundwater to drain into the circumferential plant drain and prevents a buildup of ground water pressure on the structural slab. The interior floors are of reinforced concrete construction supported on concrete walls and columns. The interior and exterior concrete walls adjacent to high radioactivity provide biological shielding. The superstructure is structural steel with insulated metal siding, and the roof is an insulated metal deck with built up roofing.

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

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

- The radioactive waste building houses equipment credited for fire protection (10 CFR 50.48).

Security Building

The security building houses the security generator, which is credited as a source of backup power to the station security lighting system, including the station perimeter fence lighting. The perimeter fence lighting provides illumination for exterior access and egress in the event of an Appendix R fire and a loss of the plant's 115KV offsite power.

This structure has no intended functions for 10CFR54.4(a)(1) or (a)(2).

The structure has the following intended functions for 10CFR54.4(a)(3).

- The security building houses equipment credited fire protection (10CFR50.48).

Standby Gas Treatment (SGT) Building

This structure, which houses the standby gas treatment equipment, is attached to the reactor building and described with the reactor building in UFSAR Section 12.3.1. It is treated as a separate structure because of its designation on UFSAR Figure 12.1-2.

The standby gas treatment building is a poured-in-place reinforced concrete structure adjacent to the reactor building southeast corner. All construction joints below grade contain preformed water stops for watertightness, and vertical joints above grade provide airtightness. The roof is of reinforced concrete construction.

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 structure houses equipment credited for fire protection (10 CFR 50.48).
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

Transformer/Switchyard Support Structures

The offsite power source required to support SBO recovery actions is the source fed through one of the reserve station service transformers, T2 or T3. Specifically, the path includes the 115 kV switchyard circuit breaker feeding either reserve station service transformer, the reserve station service transformer, the circuit breaker-to-transformers and transformer-to-onsite electrical distribution interconnections, and the associated control circuits and structures.

The purpose of the transformer/switchyard support structures is to provide physical support to the reserve station service transformers, T2 or T3 and the other switchyard components in the SBO recovery path. These support structures include the transformer foundations, transformer pothead foundations and support steel, and foundations for the associated switchyard breakers.

The NRC has required that systems and structures relied upon to restore offsite AC power (including the on-site portion of the offsite power sources) and onsite AC power be included within the license renewal scope for SBO (10CFR50.63). Therefore, the transformer support structures are within the scope of license renewal based on the criterion of 10CFR54.4(a)(3).

The transformer/switchyard support structures have no intended functions for (10CFR54.4(a)(1) or (a)(2).

The transformer/switchyard support structures have the following intended function for 10CFR54.4(a)(3).

- Provide support for equipment credited for station blackout (10CFR50.63).

Transmission Tower (SBO Recovery Path) and Foundation

The offsite power source required to support SBO recovery actions is the source fed through one of the reserve station service transformers, T2 or T3. Specifically, the path includes the 115 kV switchyard circuit breaker feeding either reserve station service transformer, the reserve station service transformer, the circuit breaker-to-transformers and transformer-to-onsite electrical distribution interconnections, and the associated control circuits and structures.

The purpose of the transmission towers is to provide physical support to the transmission lines in the SBO recovery path. The transmission tower structures include the tower foundations and tower steel. The seismic Class II transmission tower is of galvanized steel construction supported on a reinforced concrete foundation.

The NRC has required that systems and structures relied upon to restore offsite AC power (including the on-site portion of the offsite power sources) and onsite AC power be included within the license renewal scope for SBO (10 CFR 50.63). Therefore, the transmission towers are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(3).

The transmission towers have no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The transmission towers have the following intended function for 10 CFR 54.4(a)(3).

- Provide support for equipment credited for station blackout (10 CFR 50.63).

Turbine Building (TB), including Feedwater Heater Bay (HBAY)

The turbine building and heater bay house the main turbine generator, condensate/feedwater system and other plant auxiliary systems.

The turbine building is a reinforced concrete structure with structural steel supported concrete floors. The superstructure housing the turbine building crane is a structural steel frame covered with insulated metal siding and metal roof deck with insulation and built-up roofing. The interior walls of the turbine building are reinforced concrete or concrete block designed to provide radiation shielding and fire protection as required to protect plant personnel and equipment. The turbine generator support foundation is a concrete, multi-framed pedestal, supported on a reinforced concrete mat sitting on bedrock. The pedestal is completely isolated from the surrounding structure. The main steam lines to the turbine generator from the reactor are housed in a reinforced concrete tunnel that enters the turbine building after passing under the adjacent administration building. The reinforced concrete tunnel walls and roof are designed for radiation shielding.

The seismic Class II heater bay, which houses the feedwater heaters, is an integral part of the turbine building. It is a reinforced concrete structure below ground level with structural steel-supported concrete and grating floors. The superstructure, consisting of one exterior wall and roof, is constructed of a structural steel frame. The exposed wall is insulated metal siding and the roof, except directly over the heaters, is of metal deck construction with insulation and built-up roofing. The roof over the heaters is of reinforced concrete to provide radiation protection.

The turbine building 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 turbine building houses equipment credited for fire protection (10 CFR 50.48).
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

UFSAR References

Sections 12.2.2 and 12.3.3 (ADMIN); 10.9.3 (CST foundation); 12.2.2 and 12.3.2 (EBAY); 12.2.2 and 12.3.5 (EDG); 12.3.9 (main stack); 5.2.3.8.6 and 12.3.12 (CAD); 12.3.4 (RW); 8.4 and 8.5 (transformers); 12.3.1 (SGT); 12.3.2 (TB)

Figures 12.1-2, 12.3-14, 12.3-15, 12.3-20 (shows battery rooms) (ADMIN); 12.1-2 (CST foundation); 12.1-2, 12.3-21 (EBAY); 12.1-2, 12.3-22 (EDG); 12.3-12, 12.3-13 (main stack); 12.1-2 (CAD); 12.1-2 (RW): 12.1-2, 12.3-21 (transformers); 12.1-2, 12.3-11 (SGT); 12.1-2, 12.3-16 through 12.3-20 (TB)

Drawing FC-13L (manholes and duct banks); Drawing 8.6-21 (transmission towers)

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, control building complex, and yard structures are included in this review. Those that are common to JAFNPP in-scope systems and structures (i.e., anchors, embedments, component and piping supports, instrument panels, racks, cable trays, and conduits) are reviewed with the bulk commodities (Section 2.4.4).

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 through 2.4.3). Bulk commodities common to JAFNPP in-scope SSCs (e.g., anchors (including rock bolts), embedments, pipe and equipment supports, instrument panels and racks, cable trays, and conduits) are addressed in this section.

Bulk commodities have the following intended functions for 10 CFR 54.4(a)(1), (a)(2), and (a)(3).

- Provide support, shelter and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal.

Insulation may have the specific intended functions of (1) controlling the heat load during design basis accidents in areas with safety-related equipment, or (2) maintaining integrity such that falling insulation does not damage safety-related equipment (reflective metallic type reactor vessel insulation).

UFSAR References

None

Components Subject to Aging Management Review

Insulation is subject to aging management review if it performs an intended function as described above.

Table 2.4-4 lists the component types that require aging management review.

Table 3.5.2-4 provides the results of the aging management review.

**Table 2.4-1
Reactor Building
Components Subject to Aging Management Review**

Component	Intended Function[1]
Steel and Other Metals	
Battery racks A and B, steel framing	Shelter or protection Support for criterion (a)(1) equipment
CRD removal hatch	Missile barrier Pressure boundary Shelter or protection Support for criterion (a)(1) equipment
Drywell equipment hatch	Missile barrier Pressure boundary Shelter or protection Support for criterion (a)(1) equipment
Drywell head manway cover	Missile barrier Pressure boundary Shelter or protection Support for criterion (a)(1) equipment
Drywell personnel access lock	Missile barrier Pressure boundary Shelter or protection Support for criterion (a)(1) equipment
Drywell personnel escape lock	Missile barrier Pressure boundary Shelter or protection Support for criterion (a)(1) equipment
Drywell shell	Missile barrier Pressure boundary Shelter or protection Support for criterion (a)(1) equipment
Drywell shell protection panels (jet deflectors)	Missile barrier Support for criterion (a)(1) equipment
Drywell stabilizer supports	Support for criterion (a)(1) equipment

Table 2.4-1
Reactor Building
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Drywell to torus vent line bellows	Pressure boundary Support for criterion (a)(1) equipment
Drywell to torus vent system	Pressure boundary Support for criterion (a)(1) equipment
Equipment access lock doors	Fire barrier Missile barrier Pressure boundary Shelter or protection Support for criterion (a)(1) equipment
Flood bulkhead wall	Flood barrier Shelter or protection
Inner refueling bellows	Pressure boundary Support for criterion (a)(1) equipment
Metal siding	Fire barrier Pressure boundary
New fuel storage racks	Shelter or protection Support for criterion (a)(1) equipment
Primary containment electrical penetrations	Pressure boundary Support for criterion (a)(1) equipment
Primary containment mechanical penetrations (includes those w/bellows)	Pressure boundary Support for criterion (a)(1) equipment
Primary shield wall lateral supports	Missile barrier Shelter or protection Support for criterion (a)(1) equipment
Primary shield wall (steel portion)	Missile barrier Shelter or protection Support for criterion (a)(1) equipment
Reactor building crane, rails and girders	Support for criterion (a)(2) equipment
Reactor vessel stabilizer assembly	Support for criterion (a)(1) equipment

Table 2.4-1
Reactor Building
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Reactor vessel support assembly	Support for criterion (a)(1) equipment
Refueling bridge equipment assembly	Support for criterion (a)(2) equipment
Spent fuel pool liner plate and gate	Shelter or protection Support for criterion (a)(1) equipment
Spent fuel pool storage racks	Support for criterion (a)(1) equipment
Structural steel: beams, columns and plates	Fire barrier Missile barrier Shelter or protection Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment
Torus electrical penetrations	Pressure boundary Support for criterion (a)(1) equipment
Torus external supports (saddles, columns)	Support for criterion (a)(1) equipment
Torus manway cover	Pressure boundary Support for criterion (a)(1) equipment
Torus mechanical penetrations	Pressure boundary Support for criterion (a)(1) equipment
Torus ring girder	Support for criterion (a)(1) equipment
Torus shell	Heat sink Pressure boundary Support for criterion (a)(1) equipment
Torus thermowells	Pressure boundary Support for criterion (a)(1) equipment
Vent header support	Support for criterion (a)(1) equipment

Table 2.4-1
Reactor Building
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Concrete	
Beams, columns, floor slabs, and interior walls	Fire barrier Flood barrier Missile barrier Shelter or protection Support for criterion (a)(1) equipment
Biological shield wall	Missile barrier Shelter or protection Support for criterion (a)(1) equipment
Drywell fill slab	Support for criterion (a)(1) equipment
Drywell sump	Support for criterion (a)(1) equipment
Exterior walls above and below grade	Fire barrier Flood barrier Missile barrier Pressure boundary Support for criterion (a)(1) equipment
Foundation	Flood barrier Pressure boundary Support for criterion (a)(1) equipment
Masonry walls	Fire barrier Missile barrier Shelter or protection Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment
New fuel storage vault	Missile barrier Shelter or protection Support for criterion (a)(2) equipment
Primary shield wall (concrete portion)	Missile barrier Shelter or protection Support for criterion (a)(1) equipment
Reactor building sump structure	Support for criterion (a)(1) equipment

Table 2.4-1
Reactor Building
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Reactor pedestal	Support for criterion (a)(1) equipment
Spent fuel pool wall and floor slab	Missile barrier Shelter or protection Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment
Other materials	
Moisture barrier	Shelter or protection Support for criterion (a)(1) equipment
Primary containment electrical penetration seals and sealant	Pressure boundary Support for criterion (a)(1) equipment
Rubber seal for equipment lock doors	Pressure boundary Support for criterion (a)(1) equipment
Lubrite sliding supports	Support for criterion (a)(1) equipment

1. 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[1]
Steel and Other Metals	
Crane rails and girders	Support for criterion (a)(2) equipment
Metal roof decking	Support for criterion (a)(3) equipment
Metal siding	Shelter or protection Support for criterion (a)(3) equipment
Structural steel: beams, columns and plates	Fire barrier Shelter or protection Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment
Concrete	
Beams, columns, floor slabs and walls (above grade)	Fire barrier Flood barrier Heat sink Missile barrier Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment
Beams, columns, floor slabs and walls (below grade)	Flood barrier Heat sink Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment
Exterior walls above grade	Fire barrier Flood barrier Missile barrier Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment
Exterior walls below grade	Flood barrier Heat sink Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment

Table 2.4-2
Water Control Structures
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Intake and discharge tunnels	Flood barrier Heat sink Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment
Foundation	Missile barrier Shelter or protection Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment
Masonry wall	Fire barrier Shelter or protection Support for criterion (a)(3) equipment
Fire pump room roof slab	Fire barrier Support for criterion (a)(2) equipment Support for criterion (a)(3) equipment

1. Intended functions are defined in Table 2.0-1.

Table 2.4-3
Turbine Building Complex, and Yard Structures
Components Subject to Aging Management Review

Component	Intended Function[1]
Steel and Other Metals	
Control room ceiling support system	Support for criterion (a)(2) equipment
Crane rails and girders	Support for criterion (a)(2) equipment
Metal siding	Fire barrier Shelter or protection Support for criterion (a)(3) equipment
Roof decking	Fire barrier Support for criterion (a)(3) 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
Transmission tower	Support for criterion (a)(3) equipment
Concrete	
CST wall below grade	Missile barrier Shelter or protection Support for criterion (a)(2) equipment
Duct banks	Shelter or protection
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

Table 2.4-3
Turbine Building Complex, and Yard Structures
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Floor slabs, interior walls, and ceilings	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
Foundations	Shelter or protection Support for criterion (a)(1) equipment Support for criterion (a)(3) equipment
Manholes	Shelter or protection
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
Shield wall	Shelter or protection Support for criterion (a)(2) equipment

1. Intended functions are defined in Table 2.0-1.

Table 2.4-4
Bulk Commodities
Components Subject to Aging Management Review

Component	Intended Function[1]
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

Table 2.4-4
Bulk Commodities
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Electrical and instrument panels and enclosures	Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment Support for criterion (a)(3) equipment
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 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
Monorails	Support for criterion (a)(2) equipment

Table 2.4-4
Bulk Commodities
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Penetration sleeves (mechanical/ electrical not penetrating PCS 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
Stairway, handrail, platform, decking, and ladders	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	Flood barrier

Table 2.4-4
Bulk Commodities
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Manways, hatches and hatch covers	Fire barrier Flood barrier Pressure boundary Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment Support for criterion (a)(3) equipment
Missile shields	Missile barrier
Support pedestals	Support for criterion (a)(1) equipment Support for criterion (a)(2) equipment Support for criterion (a)(3) equipment
Other Materials	
Fire stops	Fire barrier
Fire wrap	Fire barrier
Insulation	Insulation Support for criterion (a)(2) equipment
Penetration sealant (fire, flood, radiation)	Fire barrier Flood barrier Pressure boundary 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
Water stops	Flood barrier

1. 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 instrument and control (I&C) systems are included in the scope of license renewal as are electrical and I&C components in mechanical systems. The default inclusion of plant electrical and I&C systems in the scope of license renewal reflects the method used for the integrated plant assessments (IPA) of electrical systems, which is different from the methods used for mechanical systems and structures.

The basic philosophy used in the electrical and I&C components IPA is that components are included in the review unless they are specifically screened out. When used with the plant spaces approach, this method eliminates the need for unique identification of every component and its specific location. This assures components are not improperly excluded from an aging management review.

The electrical and I&C IPA began by grouping the total population of components into commodity groups. The commodity groups include similar electrical and I&C components with common characteristics. Component level intended functions of the commodity groups were identified.

During the IPA, commodity groups and specific plant systems were eliminated from further review as the intended functions of commodity groups were examined.

In addition to the plant electrical systems, certain switchyard components required to restore offsite power following a station blackout 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 (SBO) (10 CFR 50.63). The evaluation boundaries of the offsite power system are described below.

The purpose of the offsite power system (Figure 2.5-1) is to provide the electrical interconnection between JAFNPP and the offsite transmission network.

UFSAR References

Additional details for electrical commodities can be found in UFSAR Chapters 7 and 8.

Evaluation Boundaries

Plant electrical and instrument and control systems are included in the scope of license renewal as are electrical and I&C components in mechanical systems.

The offsite power sources required to support SBO recovery actions are the sources fed through the reserve station service transformers (T2 and T3). Specifically, the path includes the switchyard circuit breakers feeding the reserve station service shutdown transformers, the reserve station service transformers, the circuit breaker-to-transformer and transformer-to-onsite electrical distribution interconnections, and the associated control circuits and structures.

Components Subject to AMR

As discussed in Section 2.1.2.3.1, JAFNPP electrical commodity groups correspond to two of the commodity groups identified in NEI 95-10. The two commodity groups are

- high voltage insulators, and
- cables and connections, bus, electrical portions of electrical and I&C penetration assemblies.

The commodity group cables, connections, bus, and electrical portions of I&C penetration assemblies is further divided into the following.

- cable connections (metallic parts)
- electrical cables and connections subject to 10 CFR 50.49 EQ requirements
- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements
- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits
- fuse holders – insulation material
- fuse holders – metallic clamp
- inaccessible medium-voltage (2 kV to 35 kV) cables (e.g., installed underground in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements
- metal enclosed bus connections
- metal enclosed bus – enclosure assemblies
- metal enclosed bus insulation / insulators
- oil-filled cable system – mechanical / electrical
- switchyard bus
- transmission conductors
- uninsulated ground conductors

Each of these commodity groups is subject to aging management review with the following exceptions.

- Electrical cables and connections subject to 10 CFR 50.49 EQ requirements are not subject to aging management review since the components are replaced based on qualified life.
- Fuse holders with metallic clamps are either part of a complex active assembly or part of circuits that perform no license renewal intended function.
- JAFNPP does not have any inaccessible underground medium volt cables that perform a license renewal intended function.
- Uninsulated ground conductors limit equipment damage in the event of a circuit failure, but do not perform an intended function for license renewal.

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
Fuse holders (insulation material)	Insulation (electrical)
High voltage insulators (for SBO)	Insulation (electrical)
Metal-enclosed bus (non- segregated bus for SBO), connections	Conducts electricity
Metal-enclosed bus (non- segregated bus for SBO), insulation/ insulators	Insulation (electrical)
Metal-enclosed bus (non-segregated bus for SBO) enclosure assemblies	Support for Criterion (a)(3) equipment
Oil-filled cable system (passive mechanical for SBO)	Pressure boundary
Oil-filled cable system (passive electrical for SBO)	Conducts electricity
Switchyard bus (switchyard bus for SBO), connections	Conducts electricity
Transmission conductors (transmission conductors for SBO), connections	Conducts electricity

1. Intended functions are defined in Table 2.0-1.

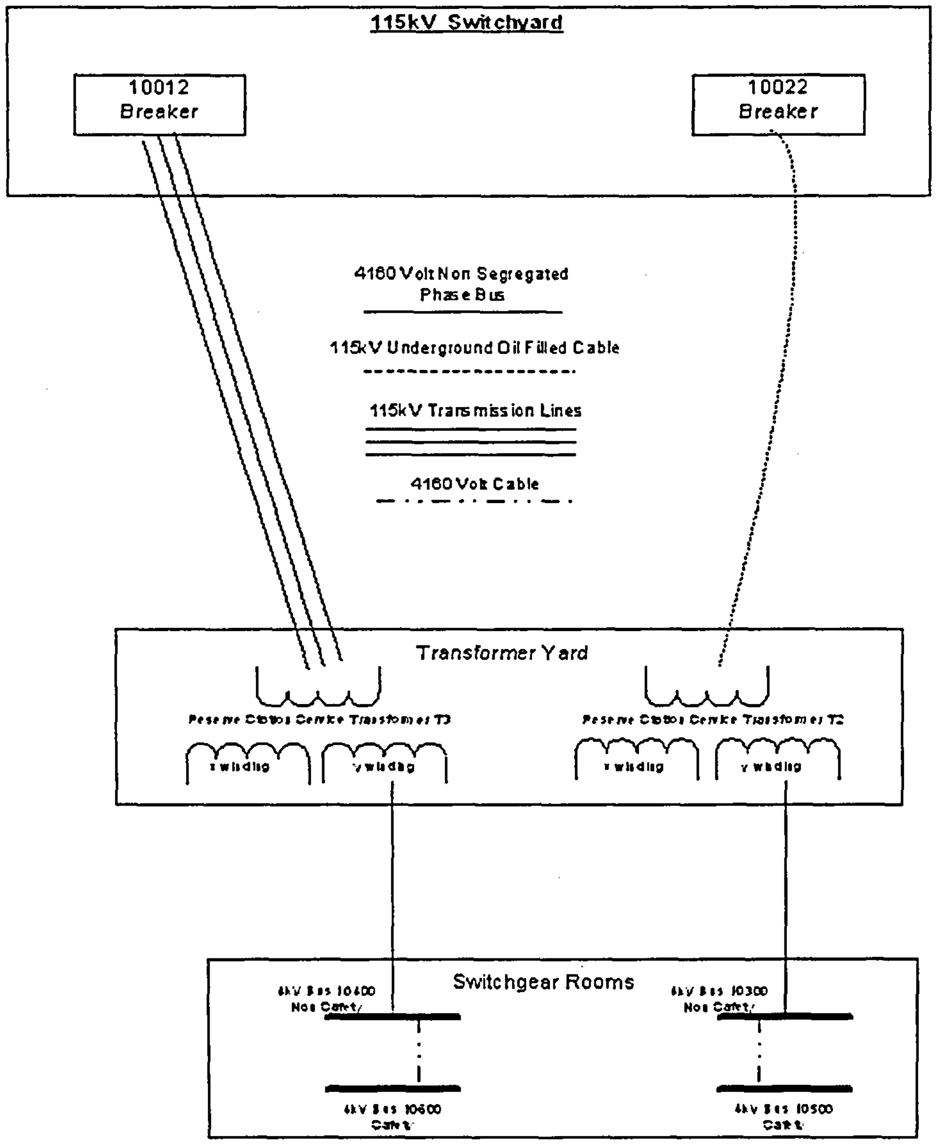

Figure 2.5-1
SBO Offsite Power Scoping Diagram

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-1801 (Reference 3.0-2), Volume 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-1801, Volume 1, 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-1801, Volume 1,

  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 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

NUREG-1801 contains the NRC Staff's generic evaluation of existing plant programs. It documents the technical basis for determining whether existing programs are adequate without modification or should be augmented for the extended period of operation. Evaluation results documented in the report indicate that many existing programs are adequate, without modification, to manage the aging effects for particular structures or components within the scope of license renewal. The report also contains recommendations on specific areas for which existing programs should be augmented for license renewal.

To take full advantage of NUREG-1801, JAFNPP AMR results have been compared with information set forth in the tables of NUREG-1801. Results of that comparison are provided in the following two table types, Table 1 and Table 2.

Table 1

The purpose of Table 1 is to provide a summary comparison of how the JAFNPP AMR results align with the corresponding table of NUREG-1801, Volume 1. These tables are essentially the same as Tables 1 through 6 provided in NUREG-1801, Volume 1, 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 "Related Item" column has been replaced by a "Discussion" column.

The "Item Number" column provides a means to cross-reference to Table 1 from the Table 2s.

Further information is provided in the "Discussion" column. 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-1801 assumptions;
- a discussion of how the line item is consistent with the corresponding line item in NUREG-1801, Volume 1, when it may not be intuitively obvious;
- a discussion of how the line item is different than the corresponding line item in NUREG-1801, Volume 1, when it may appear to be consistent.

Table 2

Table 2 provides 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 NUREG-1801 system group. For example, the engineered safety features system group contains tables specific to residual heat removal, core spray, automatic depressurization, high pressure coolant injection, reactor core isolation cooling, standby gas treatment, and primary containment penetrations.

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. Similar to Section 2, component types are listed in alphabetical order. In the Class 1 tables in Section 3.1 and the structural tables in Section 3.5, component types are alphabetical by sub-groups.

The term "piping" in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. If such components have unique tag numbers or the specific component has a function other than pressure boundary, then flow elements, orifices and thermowells are identified as a separate component type.

The term "heat exchanger (shell)" may include the bonnet/channel head and tubesheet. In cases where the bonnet/channel head and tubesheet provide a unique material and environment combination, they will be uniquely identified as a separate component type.

The general component type of "tank" includes components identified as tanks or accumulators on LRA drawings.

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. A description of these environments is provided in Tables 3.0-1, 3.0-2, and 3.0-3 for mechanical, structural, and electrical components, respectively.

Aging Effect Requiring Management

Column 5 lists the aging effects requiring management for material and environment combinations for each component type.

Aging Management Programs (AMP)

Column 6 lists the programs used to manage the aging effects requiring management.

NUREG-1801, Vol. 2, Item

Column 7 documents identified consistencies by noting the appropriate NUREG-1801, Volume 2, item number. If there is no corresponding item number in NUREG-1801, Volume 2, for a particular combination of factors, column 7 is left blank.

Each combination of the following factors listed in Table 2 is compared to NUREG 1801, Volume 2, to identify consistencies.

- component type
- material
- environment
- aging effect requiring management
- aging management program

Comparisons of system and structure aging management results to NUREG-1801 Volume 2 items are generally within the corresponding system group and preferably within the specific system or structure. For example, aging management results for the core spray system will generally be compared to NUREG-1801, Volume 2 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, Volume 2 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-1801, Volume 1, then column 8 is left blank.

Each combination of the following that has an identified NUREG-1801, Volume 2 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, Volume 2. Notes that use letter designations are standard notes based on Appendix F of Reference 3.0-3. Notes that use numeric designators are specific to JAFNPP.

TABLE USAGE

Table 1

Information in the following columns is taken directly from NUREG-1801, Volume 1.

- Component
- Aging Effect/Mechanism
- Aging Management Programs
- Further Evaluation Recommended

The Discussion column explains, in summary, how the JAFNPP evaluations align with NUREG-1801, Volume 1.

Table 2

Table 2 contains the aging management review results and indicates whether or not the results correspond to line items in NUREG-1801, Volume 2. This table provides the following information in the first six columns.

- Component type
- Component intended function
- Material
- Environment
- Aging effect requiring management
- AMP credited

If there is a correlation between the combination in Table 2 and a combination for a line item in NUREG-1801, Volume 2, this will be identified by the NUREG-1801, Volume 2, item number in column 7. If the column is blank, no appropriately corresponding combination in NUREG-1801, Volume 2, was identified.

If a NUREG-1801, Volume 2, line item is identified, the next column provides a reference to a Table 1 row number. This reference corresponds to the NUREG-1801, Volume 2, "roll-up" to the NUREG-1801, Volume 1, tables.

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, Volume 2.

REFERENCES

3.0-1 NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, Revision 1, U. S. Nuclear Regulatory Commission, September 2005.

3.0-2 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Volumes 1 and 2, Revision 1, U. S. Nuclear Regulatory Commission, September 2005.

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	Indoor air. Although inerted with nitrogen, primary containment air is conservatively considered equivalent to reactor building ambient air and both are referred to as air – indoor.
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.
Nitrogen	Nitrogen gas used in scram accumulators
Treated water	Treated or demineralized water[1]
Treated water > 140°F	Treated or demineralized water above stress corrosion cracking (SCC) threshold for stainless steel. Steam is considered treated water.
Treated water > 482°F	Treated or demineralized water above thermal embrittlement threshold for CASS. Steam is considered treated water.
Non-Class 1 Mechanical Environments	
Air – indoor	Indoor air on systems with temperatures above the dewpoint. Although inerted with nitrogen, primary containment air is conservatively considered as air – indoor.
Air – outdoor	Exposed to air and local weather conditions
Air – treated	Air that is dried and filtered
Air – untreated	Compressed air with moisture, etc.
Concrete	Components embedded in concrete
Condensation	Air and condensation on surfaces of indoor systems with temperatures below the dewpoint. For exterior surfaces, condensation is considered untreated water due to potential for surface contamination.
Exhaust gas	Gas present in a diesel engine exhaust
Fire protection foam	Fluoroprotein foam concentrate stored as a liquid for combination with water for fire suppression
Fuel oil	Fuel oil such as used for combustion engines, boilers, etc.

Table 3.0-1 (Continued)
Service Environments for Mechanical Aging Management Reviews

Environment	Description
Gas	Inert gas such as carbon dioxide, Freon, Halon, nitrogen, etc.
Liquid nitrogen	Liquid nitrogen for containment atmospheric dilution system
Lube oil	Lubricating oil for plant equipment
Raw water	Raw, untreated fresh water or water not treated by a chemistry program such as water collected in floor drains and sumps
Sodium pentaborate solution	Sodium pentaborate solution (SLC system)
Soil	External environment for components buried in the soil, including groundwater in the soil
Treated water	Treated or demineralized water[1]
Treated water > 140°F	Treated water above the SCC threshold for stainless steel
Vacuum	Vacuum environment between the inner and outer walls of the liquid nitrogen storage tank

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 cooling water 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
Protected from weather	Air with temperature less than 150°F, humidity up to 100% and protected from precipitation
Exposed to weather (includes above grade and below grade)	Exposed to the weather with air temperature less than 115°F, humidity up to 100%
Exposed to fluid environment	Fluid environment at JAFNPP is defined as raw water or treated water.

Table 3.0-3
Service Environments for Electrical Aging Management Reviews

Environment	Description
Heat and air	Indoor air at normal operating temperature.
Radiation and air	Normal plant operating radiation levels.
Oil	Oil used in oil-filled cables
Moisture and voltage stress	A wetted environment with applied voltage of 2 kV to 35 kV. Applies to underground medium-voltage cables energized at least 25% of the time.
Outdoor weather	Ambient outdoor conditions.

3.1 REACTOR VESSEL, INTERNALS AND REACTOR COOLANT SYSTEM

3.1.1 Introduction

This section provides the results of the aging management reviews for components in the reactor vessel, internals and reactor coolant system that are subject to aging management review. The following component groups are addressed in this section (component group descriptions are available in the referenced sections).

- reactor vessel (Section 2.3.1.1)
- reactor vessel internals (Section 2.3.1.2)
- reactor coolant pressure boundary (Section 2.3.1.3)

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

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 3.1.2-3.

3.1.2.1.1 Reactor Vessel

Materials

Reactor vessel components are constructed of the following materials.

- carbon steel
- high-strength low-alloy steel
- low-alloy steel

- low-alloy steel with partial stainless steel (SS) cladding
- low-alloy steel with SS cladding
- low-alloy steel clad with nickel-based alloy cladding
- nickel-based alloy
- stainless steel

Environment

Reactor vessel components are exposed to the following environments.

- air – indoor
- neutron fluence
- treated water
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the reactor vessel require management.

- cracking
- cracking – fatigue
- loss of material
- 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.

- cast austenitic stainless steel (CASS)
- nickel-based alloy
- stainless steel

Environment

Reactor vessel internals components are exposed to the following environments.

- air – indoor
- neutron fluence
- 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 preload
- 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
- One-Time Inspection
- Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)
- 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
- CASS
- low-alloy steel
- stainless steel

Environment

Reactor coolant pressure boundary components are exposed to the following environments.

- air – indoor
- nitrogen
- 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
- 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
- One-Time Inspection
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Cooling Water

3.1.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 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 JAFNPP 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 Section 4.3.1.1.

The reactor vessel internals are not part of the reactor coolant pressure boundary. Although not mandatory, fatigue analyses were performed for selected internals components. For those internals components analyzed, the evaluation of fatigue is discussed in Section 4.3.1.2. Cracking, including cracking due to fatigue, will be managed by the BWR Vessel Internals Program for other internals components.

With the exception of the main steam line flow restrictors and reactor water recirculating pumps, evaluation of the fatigue TLAA for the Class 1 portions of the reactor coolant pressure boundary piping and components, including those for interconnecting systems is discussed in Section 4.3.1.3. No fatigue analysis was required for the main steam line flow restrictors or reactor water recirculating pumps. Cracking, including cracking due to fatigue, will be managed by the One-Time Inspection Program for the main steam line flow restrictors, and by the Inservice Inspection Program for the reactor water recirculating pumps.

3.1.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

1. Loss of material due to general, pitting, and crevice corrosion in steel components of the reactor pressure vessel exposed to reactor coolant is managed at JAFNPP by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

2. This paragraph in NUREG-1800 pertains to BWR isolation condenser components. JAFNPP does not have an isolation condenser; however, loss of material due to general, pitting, and crevice corrosion in other steel components within the reactor coolant pressure boundary exposed to reactor coolant is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time

Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

3. Loss of material due to general, pitting, and crevice corrosion in stainless steel, nickel-alloy and steel with stainless steel or nickel-alloy clad components of the reactor pressure vessel, and loss of material in stainless steel (including CASS) components of the reactor coolant pressure boundary exposed to reactor coolant is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

4. This paragraph in NUREG-1800 applies to PWRs only.

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. JAFNPP is a participant in the Boiling Water Reactor Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (ISP) (see Reactor Vessel Surveillance Program in Appendix B). This program monitors changes in the fracture toughness properties of ferritic materials in the reactor pressure vessel (RPV) beltline region.

3.1.2.2.4 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking (IGSCC)

1. The Water Chemistry Control – BWR Program manages cracking due to SCC and IGSCC in the stainless steel vessel flange leak detection lines. The One-Time Inspection Program will verify the effectiveness of the Water Chemistry Control – BWR Program. The One-Time Inspection Program will include the vessel flange leak off piping when determining an inspection sample representative of all JAFNPP small bore piping and includes the use of volumetric examination for the detection of cracking.

2. This paragraph in NUREG-1800 pertains to BWR isolation condenser components. JAFNPP does not have an isolation condenser, so this paragraph is not applicable.

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 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement and Void Swelling

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.7 Cracking due to Stress Corrosion Cracking

Both paragraphs in NUREG-1800 apply to PWRs only.

3.1.2.2.8 Cracking due to Cyclic Loading

1. This paragraph in NUREG-1800 pertains to the jet pump sensing lines inside the reactor vessel. The lines inside the vessel do not form part of the RCS pressure boundary and their failure would not affect the performance of any functions in the scope of license renewal. At JAFNPP, these lines have no license renewal intended function and thus are not subject to aging management review. However, the lines outside the vessel are part of the RCS pressure boundary and hence are subject to aging management review.

2. This paragraph in NUREG-1800 pertains to BWR isolation condenser components. As JAFNPP does not have an isolation condenser, this paragraph is not applicable.

3.1.2.2.9 Loss of Preload due to Stress Relaxation

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.10 Loss of Material due to Erosion

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.11 Cracking due to Flow-Induced Vibration

Cracking due to flow-induced vibration in the stainless steel steam dryers is managed by the BWR Vessel Internals Program. JAFNPP will evaluate BWRVIP 139 once it is approved by the staff and include its appropriate recommendations in the JAFNPP BWR vessel internals program.

3.1.2.2.12 Cracking due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking (IASCC)

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.13 Cracking due to Primary Water Stress Corrosion Cracking (PWSCC)

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.14 Wall Thinning due to Flow-Accelerated Corrosion

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.15 Changes in Dimensions due to Void Swelling

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.16 Cracking due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

Both paragraphs in NUREG-1800 apply to PWRs only.

3.1.2.2.17 Cracking due to Stress Corrosion Cracking, Primary Water Stress Corrosion Cracking, and Irradiation-Assisted Stress Corrosion Cracking

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.18 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of JAFNPP 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, metal fatigue, and loss of preload. 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, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-1	Steel pressure vessel support skirt and attachment welds	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-2	Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor vessel components: flanges; nozzles; penetrations; safe ends; thermal sleeves; vessel shells, heads and welds	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-3	Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor coolant pressure boundary piping, piping components, and piping elements exposed to reactor coolant	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-4	Steel pump and valve closure bolting	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) check Code limits for allowable cycles (less than 7000 cycles) of thermal stress range	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-5	Stainless steel and nickel alloy reactor vessel internals components	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-6	PWR only				
3.1.1-7	PWR only				
3.1.1-8	PWR only				
3.1.1-9	PWR only				
3.1.1-10	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-11	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 general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage loss of material in carbon steel components of the reactor vessel. See Section 3.1.2.2.2 Item 1.
3.1.1-12	PWR only				
3.1.1-13	Steel and stainless steel isolation condenser components exposed to reactor coolant	Loss of material due to general (steel only), pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Although JAFNPP has no isolation condenser, loss of material in other steel components within the reactor coolant pressure boundary is managed by the Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness. See Section 3.1.2.2.2 Item 2.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-14	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	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in stainless steel, nickel alloy and steel with stainless steel or nickel-alloy clad components of the reactor vessel is managed by the Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness. See Section 3.1.2.2.2 Item 3.
3.1.1-15	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	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in stainless steel (including CASS) components of the reactor coolant pressure boundary is managed by the Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness. See Section 3.1.2.2.2 Item 3.
3.1.1-16	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-17	Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50 and RG 1.99. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations.	Yes, TLAA	Loss of fracture toughness for the reactor vessel beltline shell and welds is a TLAA. See Section 3.1.2.2.3 Item 1.
3.1.1-18	Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds; safety injection nozzles	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor Vessel Surveillance	Yes, plant specific	Consistent with NUREG-1801. The Reactor Vessel Surveillance Program manages reduction in fracture toughness of reactor vessel beltline materials. See Section 3.1.2.2.3 Item 2.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-19	Stainless steel and nickel alloy top head enclosure vessel flange leak detection line	Cracking due to stress corrosion cracking and 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 One-Time Inspection Programs manage cracking in the stainless steel head seal leak detection lines. See Section 3.1.2.2.4 Item 1.
3.1.1-20	Stainless steel isolation condenser components exposed to reactor coolant	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and plant-specific verification program	Yes, detection of aging effects is to be evaluated	Not applicable. JAFNPP does not have an isolation condenser. See Section 3.1.2.2.4 Item 2.
3.1.1-21	PWR only				
3.1.1-22	PWR only				
3.1.1-23	PWR only				
3.1.1-24	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-25	Stainless steel jet pump sensing line	Cracking due to cyclic loading	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The jet pump instrumentation lines inside the reactor vessel are not subject to aging management review. The lines outside the vessel are part of the RCS pressure boundary and hence are subject to aging management review. These lines are included as piping and fittings < 4" NPS and cracking of these lines is addressed by item 3.1.1-48 of this table. See Section 3.1.2.2.8 Item 1.
3.1.1-26	Steel and stainless steel isolation condenser components exposed to reactor coolant	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD) and plant-specific verification program	Yes, detection of aging effects is to be evaluated	Not applicable. JAFNPP does not have an isolation condenser. See Section 3.1.2.2.8 Item 2.
3.1.1-27	PWR only				
3.1.1-28	PWR only				
3.1.1-29	Stainless steel steam dryers exposed to reactor coolant	Cracking due to flow-induced vibration	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The BWR Vessel Internals Program will manage cracking in the stainless steel steam dryers. See Section 3.1.2.2.11.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-30	PWR only				
3.1.1-31	PWR only				
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	Steel (with or without stainless steel cladding) control rod drive return line nozzles exposed to reactor coolant	Cracking due to cyclic loading	BWR CR Drive Return Line Nozzle	No	Consistent with NUREG-1801. The BWR CRD Return Line Nozzle Program manages cracking in the low-alloy steel with stainless steel cladding control rod drive return line nozzles exposed to reactor coolant. The Water Chemistry Control – BWR Program supplements the BWR CRD Return Line Nozzle Program.
3.1.1-39	Steel (with or without stainless steel cladding) feedwater nozzles exposed to reactor coolant	Cracking due to cyclic loading	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.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-40	Stainless steel and nickel alloy penetrations for control rod drive stub tubes instrumentation, jet pump instrument, standby liquid control, flux monitor, and drain line exposed to reactor coolant	Cracking due to stress corrosion cracking, Intergranular stress corrosion cracking, cyclic loading	BWR Penetrations and Water Chemistry	No	Cracking in stainless steel, nickel alloy and steel clad with nickel-alloy nozzles and penetrations in the reactor vessel is managed by the Water Chemistry Control – BWR and either the BWR Penetrations, BWR Vessel Internals or Inservice Inspection Program.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-41	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 and intergranular stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	Cracking in stainless steel, nickel alloy and steel clad with stainless steel components in reactor coolant is managed by 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 for most components either the Inservice Inspection, One-Time Inspection, BWR Feedwater Nozzle or BWR Vessel Internals Program.
3.1.1-42	Stainless steel and nickel alloy vessel shell attachment welds exposed to reactor coolant	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Vessel ID Attachment Welds and 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.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-43	Stainless steel fuel supports and control rod drive assemblies control rod drive housing exposed to reactor coolant	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Vessel Internals and Water Chemistry	No	Consistent with NUREG-1801. The BWR Vessel Internals and Water Chemistry Control – BWR Programs manage cracking in stainless steel components of the reactor vessel and vessel internals.
3.1.1-44	Stainless steel and nickel alloy core shroud, core plate, core plate bolts, support structure, top guide, core spray lines, spargers, jet pump assemblies, control rod drive housing, nuclear instrumentation guide tubes	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	BWR Vessel Internals and Water Chemistry	No	Consistent with NUREG-1801. The BWR Vessel Internals and Water Chemistry Control – BWR Programs manage cracking in stainless steel and nickel-alloy components of the reactor vessel internals exposed to reactor coolant.
3.1.1-45	Steel piping, piping components, and piping elements exposed to reactor coolant	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Consistent with NUREG-1801. The Flow-Accelerated Corrosion Program manages wall thinning of steel components of the reactor coolant pressure boundary.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-46	Nickel alloy core shroud and core plate access hole cover (mechanical covers)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	The JAFNPP access hole covers are welded, not mechanical (bolted).
3.1.1-47	Stainless steel and nickel-alloy reactor vessel internals exposed to reactor coolant	Loss of material due to pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Loss of material in stainless steel and nickel-alloy components of the reactor vessel internals 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 Inservice Inspection Program is not applicable to most reactor vessel internals components since they are not part of the pressure boundary. Management of loss of material using the Water Chemistry Program augmented by the One-Time Inspection Program is consistent with other items of this table, including 3.1.1-14 and 3.1.1-15.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-48	Steel and stainless steel 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 and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water chemistry, and 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 Program, which is consistent with NUREG-1801 programs XI.M32, One-Time Inspection and XI.M35, One-Time Inspection of ASME Code Class 1 Small-bore Piping, will verify the effectiveness of the water chemistry program and will manage cracking in piping and fitting < 4" NPS. Cracking in steel components due to thermal and mechanical loading is not directly dependent on water chemistry, so only the Inservice Inspection and One-Time Inspection Programs are credited.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-49	Nickel alloy core shroud and core plate access hole cover (welded covers)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and, for BWRs with a crevice in the access hole covers, augmented inspection using UT or other demonstrated acceptable inspection of the access hole cover welds	No	JAFNPP has welded access hole covers with no crevice behind the weld. Cracking of the nickel-alloy shroud support access hole covers is managed by the BWR Vessel Internals and Water Chemistry Control – BWR Programs as described in line item 3.1.1-44.
3.1.1-50	High-strength low alloy steel top head closure studs and nuts exposed to air with reactor coolant leakage	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	Reactor Head Closure Studs	No	Consistent with NUREG-1801. The Reactor Head Closure Studs Program manages cracking in low alloy steel head closure flange bolting.
3.1.1-51	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	Consistent with NUREG-1801. The Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program manages the reduction of fracture toughness in cast austenitic stainless steel components of the reactor vessel internals.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-52	Steel and stainless steel reactor coolant pressure boundary (RCPB) pump and valve closure bolting, manway and holding bolting, flange bolting, and closure bolting in high-pressure and high-temperature systems	Cracking due to stress corrosion cracking, loss of material due to wear, loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Cracking of stainless steel bolting is managed by the Bolting Integrity Program. 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. Loss of preload is a design driven effect and not an aging effect requiring management. Bolting at JAFNPP is standard grade B7 low alloy steel, or similar material, except in rare specialized applications such as where stainless steel bolting is utilized. Loss of preload due to stress relaxation (creep) would only be a concern in very high temperature applications (> 700°F) as stated in the ASME Code, Section II, Part D, Table 4. No JAFNPP bolting operates at > 700°F. Therefore, loss of preload due to stress relaxation (creep) is not an applicable aging effect for the reactor coolant system. (continued)

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					Other issues that may result in pressure boundary joint leakage are improper design or maintenance issues. Improper bolting application (design) and maintenance issues are current plant operational concerns and not related to aging effects or mechanisms that require management during the period of extended operation. As described in the Bolting Integrity Program, JAFNPP has taken actions to address NUREG–1339, *Resolution to Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants*. These actions include implementation of good bolting practices in accordance with EPRI NP-5067, "Good Bolting Practices." Proper joint preparation and make-up in accordance with industry standards is expected to preclude loss of preload. This has been confirmed by operating experience at JAFNPP.
3.1.1-53	Steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to general, pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Not applicable. There are no steel components of the Class 1 reactor vessel, vessel internals or reactor coolant pressure boundary exposed to closed cycle cooling water.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-54	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable. There are no copper alloy components of the Class 1 reactor vessel, vessel internals or reactor coolant pressure boundary exposed to closed cycle cooling water.
3.1.1-55	Cast austenitic stainless steel Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Inservice inspection (IWB, IWC, and IWD). Thermal aging susceptibility screening is not necessary, inservice inspection requirements are sufficient for managing these aging effects. ASME Code Case N-481 also provides an alternative for pump casings.	No	The Inservice Inspection and One-Time Inspection Programs manage the reduction of fracture toughness in cast austenitic stainless steel components of the reactor coolant pressure boundary.
3.1.1-56	Copper alloy >15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no copper alloy components in the Class 1 reactor vessel, vessel internals or reactor coolant pressure boundary.

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Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-57	Cast austenitic stainless steel Class 1 piping, piping component, and piping elements and control rod drive pressure housings exposed to reactor coolant >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	The One-Time Inspection Program manages the reduction of fracture toughness in cast austenitic stainless steel main steam flow restrictors. JAFNPP has no other Class 1 piping, piping components, piping elements, or CRD housings made of CASS. Pump casings and valve bodies and other CASS components are included in item numbers 3.1.1-51 and 3.1.1-55 above.
3.1.1-58	PWR only				
3.1.1-59	PWR only				
3.1.1-60	PWR only				
3.1.1-61	PWR only				
3.1.1-62	PWR only				
3.1.1-63	PWR only				
3.1.1-64	PWR only				
3.1.1-65	PWR only				
3.1.1-66	PWR only				
3.1.1-67	PWR only				
3.1.1-68	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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				
3.1.1-79	PWR only				
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	PWR only				

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Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-85	Nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.1.1-86	Stainless steel piping, piping components, and piping elements exposed to air – indoor uncontrolled (External); air with borated water leakage; concrete; gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.1.1-87	Steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Not applicable. There are no components of the Class 1 reactor vessel, vessel internals or reactor coolant pressure boundary exposed to concrete.

Notes for Tables 3.1.2-1 through 3.1.2-3

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 environment of air – indoor (external) is considered to be equivalent to the NUREG-1801 environment of reactor coolant for the purposes of evaluating cracking due to fatigue.

102. High component surface temperature precludes moisture accumulation that could result in corrosion.

103. This item is considered a match to NUREG-1801 even though the environments are different because the aging effect of cracking due to fatigue is independent of the environment.

104. Cracking of the head seal leak detection line is included in this line item.

105. The JAFNPP One-Time Inspection Program is consistent with both XI.M32, One-Time Inspection, and XI.M35, One-Time Inspection of ASME Code Class 1 Small-bore Piping, described in NUREG-1801. The latter aspect of the One-Time Inspection Program applies to these components.
106. 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.
107. The One-Time Inspection Program will verify effectiveness of the Water Chemistry Control – BWR 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 Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Attachments and Supports								
Reactor vessel external attachments • Stabilizer brackets • Support skirt	Support for Criterion (a)(1) equipment	Low-alloy steel Carbon steel	Air – indoor (ext)	Loss of material	Inservice Inspection			H
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-6 (R-70)	3.1.1-1	A
Reactor vessel internal attachments and welds • Core spray brackets • Feedwater sparger brackets • Guide rod brackets • Jet pump riser pads • Shroud support pad • Surveillance specimen holder brackets • Feedwater sparger brackets	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	C, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	C
				Cracking	BWR Vessel ID Attachment Welds Water Chemistry Control – BWR	IV.A1-12 (R-64)	3.1.1-42	B

Table 3.1.2-1: Reactor Vessel								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Reactor vessel internal attachments and welds • Dryer holddown brackets • Dryer support brackets	Support for Criterion (a)(1) equipment	Low-alloy steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-11 (R-59)	3.1.1-11	C, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	C
Bolting								
Incore monitor housing bolting • Flange bolts • Closure flanges • Nuts and washers CRD flange capscrews and washers	Pressure boundary	High-strength low-alloy steel	Air – indoor (ext)	Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	C, 101
				Cracking	Bolting Integrity	IV.C2-7 (R-11)	3.1.1-52	C
Other bolting • Flange bolts	Pressure boundary	Low-alloy steel	Air – indoor (ext)	Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	C, 101

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Reactor vessel closure flanges • Closure studs, nuts, washers and bushings	Pressure boundary	High-strength low-alloy steel	Air – indoor (ext)	Loss of material	Reactor Head Closure Studs			H
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	C, 101
				Cracking	Reactor Head Closure Studs	IV.A1-9 (R-60)	3.1.1-50	B
Nozzles and Penetrations								
CRD housings	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	C, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-8 (R-104)	3.1.1-43	B
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
CRD stub tubes	Pressure boundary	Low-alloy steel with nickel-based alloy cladding	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.A1-5 (R-69)	3.1.1-40	E
			Air – indoor (ext)	None	None			G, 102
Incore monitor housings	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-5 (R-69)	3.1.1-40	E
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzles • Core spray • Jet pump instrument • Recirc outlet	Pressure boundary	Low-alloy steel with SS cladding	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			Air – indoor (ext)	None	None			G, 102
Nozzle • Core ΔP / SLC	Pressure boundary	Nickel-based alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Penetrations Water Chemistry Control – BWR	IV.A1-5 (R-69)	3.1.1-40	A
			Air – indoor (ext)	None	None	IV.E-1 (RP-03)	3.1.1-85	A

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzle • CRD return	Pressure boundary	Low-alloy steel with SS cladding	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR CRD Return Line Nozzle Water Chemistry Control – BWR	IV.A1-2 (R-66)	3.1.1-38	B
			Air – indoor (ext)	None	None			G, 102
Nozzle • Drain	Pressure boundary	Low-alloy steel with partial SS cladding	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-11 (R-59) IV.A1-8 (RP-25)	3.1.1-11 3.1.1-14	C, 107 A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			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 Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzles • Feedwater	Pressure boundary	Low-alloy steel with partial SS cladding	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-11 (R-59) IV.A1-8 (RP-25)	3.1.1-11 3.1.1-14	C, 107 A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Feedwater Nozzle	IV.A1-3 (R-65)	3.1.1-39	B
			Air – indoor (ext)	None	None			G, 102
Nozzle • Flange leakoff	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-1: Reactor Vessel								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Nozzle • Flange leakoff	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-11 (R-59)	3.1.1-11	C, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
			Air – indoor (ext)	None	None			G, 102
Nozzles • Main steam • Recirc inlet	Pressure boundary	Low-alloy steel with partial SS cladding	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-11 (R-59) IV.A1-8 (RP-25)	3.1.1-11 3.1.1-14	C, 107 A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			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 Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzles • Head vent • Spare	Pressure boundary	Low-alloy steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-11 (R-59)	3.1.1-11	C, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
			Air – indoor (ext)	None	None			G, 102
Nozzles • Instrumentation	Pressure boundary	Nickel-based alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Penetrations Water Chemistry Control – BWR	IV.A1-5 (R-69)	3.1.1-40	A
			Air – indoor (ext)	None	None	IV.E-1 (RP-03)	3.1.1-85	A

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Safe Ends, Thermal Sleeves, Flanges, Caps								
CRD return line cap	Pressure boundary	Nickel-based alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR CRD Return Line Nozzle Water Chemistry Control – BWR			F
			Air – indoor (ext)	None	None	IV.E-1 (RP-03)	3.1.1-85	A
Nozzle flanges • Blank flanges • Nozzle flanges	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-11 (R-59)	3.1.1-11	C, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
			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 Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzle safe ends ≥ 4" • Core spray • Jet pump instrument • Recirc inlet/outlet	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Stress Corrosion Cracking Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	B
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Nozzle safe ends ≥ 4" • Feedwater • Main steam	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-11 (R-59)	3.1.1-11	C, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
			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 Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzle safe ends < 4" • Core ΔP / SLC • Instrumentation	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Vessel Internals (welds) Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
SLC nozzle to safe end weld	Pressure boundary	Nickel-based alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			Air – indoor (ext)	None	None	IV.E-1 (RP-03)	3.1.1-85	A

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermal sleeves • Core spray • Feedwater inlet • Recirc inlet	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Vessel Internals (core spray, recirc.) BWR Feedwater Nozzle (feedwater inlets) Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
Shell and Heads								
Reactor vessel bottom head	Pressure boundary	Low-alloy steel with SS cladding	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			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 Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Reactor vessel shell • Closure flange	Pressure boundary	Low-alloy steel with SS cladding	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			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 Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Reactor vessel shell • Lower shell and lower intermediate beltline shell (6 plates) and connecting welds	Pressure boundary	Low-alloy steel with SS cladding	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			Neutron fluence	Reduction of fracture toughness	Reactor Vessel Surveillance TLAA – neutron fluence	IV.A1-14 (R-63) IV.A1-13 (R-62)	3.1.1-18 3.1.1-17	A A
			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 Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Reactor vessel shell • Upper intermediate and upper shell	Pressure boundary	Low-alloy steel with SS cladding	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			Air – indoor (ext)	None	None			G, 102
Reactor vessel upper head • Closure flange	Pressure boundary	Low-alloy steel with SS cladding	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			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 Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Reactor vessel upper head • Top head (dome)	Pressure boundary	Low-alloy steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-11 (R-59)	3.1.1-11	C, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
			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 Vol. 2 Item**	**Table 1 Item**	**Notes**
Control rod guide tubes • Tubes • CRD thermal sleeves	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-8 (R-104)	3.1.1-43	D
Control rod guide tubes • Bases	Support for Criterion (a)(1) equipment	CASS	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-8 (R-104)	3.1.1-43	D
			Treated water > 482°F and neutron fluence	Reduction of fracture toughness	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	IV.B1-9 (R-103)	3.1.1-51	A

Table 3.1.2-2 Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Core spray lines • Brackets, piping, spargers, t-boxes, t-box and upper elbow gussets • Downcomer repair clamshell sleeve • U-bolt and clamp bolts	Flow distribution	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-7 (R-99)	3.1.1-44	B
Core support • Alignment pins, bar, eyebolt, pipe, plates	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-6 (R-93)	3.1.1-44	B

Table 3.1.2-2 Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Core support rim bolts	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 140°F (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-6 (R-93)	3.1.1-44	B
				Loss of material	Water Chemistry Control – BWR	IV.B1-15	3.1.1-47	E, 107
				Loss of preload	TLAA – loss of preload			H
Fuel support pieces • Orificed supports	Support for Criterion (a)(1) equipment	CASS	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-6 (R-93)	3.1.1-44	D
			Treated water > 482°F and neutron fluence	Reduction of fracture toughness	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	IV.B1-9 (R-103)	3.1.1-51	A

Table 3.1.2-2 Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fuel support pieces • Peripheral supports	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-6 (R-93)	3.1.1-44	D
Incore flux monitors • Dry tubes • LPRM	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-10 (R-105)	3.1.1-44	B
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Incore flux monitors • Guide tubes	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-10 (R-105)	3.1.1-44	B

Table 3.1.2-2 Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Jet pump assemblies • Riser pipe, riser elbow, riser braces • Hold down bolts • Mixer barrels • Restrainer bracket wedge assemblies • Diffuser shell, tailpipes and adapter (top piece)	Floodable volume	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking – fatigue (diffuser adapter)	TLAA – metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-13 (R-100)	3.1.1-44	B
Jet pump assemblies • Holddown beams • Diffuser adapter (bottom piece)	Floodable volume	Nickel-based alloy	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-13 (R-100)	3.1.1-44	B

Table 3.1.2-2 Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Jet pump castings • Transition piece • Inlet elbow/ nozzle • Mixer adapter • Restrainer bracket • Diffuser collar	Floodable volume	CASS	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-13 (R-100)	3.1.1-44	B
			Treated water > 482°F and neutron fluence	Reduction of fracture toughness	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	IV.B1-11 (R-101)	3.1.1-51	C
Shroud • Upper, central, and lower sections, and bolting	Support for Criterion (a)(1) equipment Floodable volume	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-1 (R-92)	3.1.1-44	B

Table 3.1.2-2 Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Shroud stabilizers • Radial restraints • Tie rod assemblies • Brackets	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-1 (R-92)	3.1.1-44	B
Shroud support • Ring, cylinder, gussets, bolting, and manway covers	Support for Criterion (a)(1) equipment Floodable volume	Nickel-based alloy	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-2 (R-96) IV.B1-5 (R-94)	3.1.1-44 3.1.1-49	B E
Steam dryers	Structural integrity	Stainless steel	Treated water > 140°F (int)	Cracking	BWR Vessel Internals	IV.B1-16 (RP-18)	3.1.1-29	E

Table 3.1.2-2 Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Top guide assembly	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E, 107
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-17 (R-98)	3.1.1-44	B

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 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A, 101
				Cracking	Bolting Integrity	IV.C2-7 (R-11)	3.1.1-52	C
		Low alloy steel, Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	C
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-11 (R-28)	3.1.1-4	A, 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 Vol. 2 Item	Table 1 Item	Notes
Condensing chambers	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Control rod drive (CRD)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR Inservice Inspection	IV.C1-1 (R-03)	3.1.1-48	E
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Driver mount (RWR)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	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 Vol. 2 Item	Table 1 Item	Notes
Filter housing (CRD)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	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 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flow elements (RWR)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	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 Vol. 2 Item	Table 1 Item	Notes
Orifices (Instrumentation)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	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 Vol. 2 Item	Table 1 Item	Notes
Piping and fittings < 4" NPS	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
			Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR Inservice Inspection One-Time Inspection	IV.C1-1 (R-03) IV.A1-10 (R-61)	3.1.1-48 3.1.1-19	E, 105 E, 104
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C, 106

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping and fittings < 4" NPS (CRD)	Pressure boundary	Stainless steel	Nitrogen (int)	None	None	IV.E-5 (RP-07)	3.1.1-86	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	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 Vol. 2 Item	Table 1 Item	Notes
Piping and fittings ≥ 4" NPS	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C, 107
					Flow-Accelerated Corrosion	IV.C1-7 (R-23)	3.1.1-45	A
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C, 106

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump casing and cover (RWR)	Pressure boundary	CASS	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
			Treated water > 482°F (int)	Reduction of fracture toughness	Inservice Inspection	IV.C1-3 (R-08)	3.1.1-55	E
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	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 Vol. 2 Item	Table 1 Item	Notes
Pump cover thermal barrier (RWR)	Pressure boundary	CASS	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	V.D2-5 (E-19)	3.2.1-28	D
				Cracking	Water Chemistry Control – Closed Cooling Water Inservice Inspection	V.D2-26 (EP-44)	3.2.1-25	D
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Restrictors (MS)	Flow control	CASS	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-9 (R-20)	3.1.1-41	E
			Treated water > 482°F (int)	Reduction of fracture toughness	One-Time Inspection	IV.C1-2 (R-52)	3.1.1-57	E

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Rupture disc (CRD)	Pressure boundary	Stainless steel	Nitrogen (int)	None	None	IV.E-5 (RP-07)	3.1.1-86	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Tank (CRD accumulator)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C, 107
			Nitrogen (int)	None	None	V.F-18 (EP-7)	3.2.1-56	C
			Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
		Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
			Nitrogen (int)	None	None	IV.E-5 (RP-07)	3.1.1-86	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	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 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tank (CRD scram discharge volume)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C, 106
Thermal sleeves (FW)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR	IV.C1-9 (R-20)	3.1.1-41	E
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	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 Vol. 2 Item	Table 1 Item	Notes
Thermowells < 4" NPS (NBVI, RWR)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR Inservice Inspection One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	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 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR Inservice Inspection One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	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 Vol. 2 Item	Table 1 Item	Notes
Valve bodies < 4" NPS	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C, 107
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C, 106
		CASS	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
			Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR Inservice Inspection One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Treated water > 482°F (int)	Reduction of fracture toughness	One-Time Inspection	IV.C1-3 (R-08)	3.1.1-55	E

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve bodies < 4" NPS (continued)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
			Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
			Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR Inservice Inspection One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	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 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve bodies ≥ 4" NPS	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C, 107
					Flow-Accelerated Corrosion	IV.C1-7 (R-23)	3.1.1-45	A
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C, 106

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve bodies ≥ 4" NPS (continued)	Pressure boundary	CASS	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A, 107
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Treated water > 482°F (int)	Reduction of fracture toughness	Inservice Inspection	IV.C1-3 (R-08)	3.1.1-55	A
			Air – indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

3.2 ENGINEERED SAFETY FEATURES SYSTEMS

3.2.1 Introduction

This section provides the results of the aging management reviews for components in the engineered safety features (ESF) systems that are subject to aging management review. The following systems are addressed in this section (system descriptions are available in the referenced sections).

- residual heat removal (Section 2.3.2.1)
- core spray (Section 2.3.2.2)
- *automatic depressurization* (Section 2.3.2.3)
- high pressure coolant injection (Section 2.3.2.4)
- reactor core isolation cooling (Section 2.3.2.5)
- standby gas treatment (Section 2.3.2.6)
- primary containment penetrations (Section 2.3.2.7)

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 Core Spray System—Summary of Aging Management Evaluation
- Table 3.2.2-3 Automatic Depressurization System—Summary of Aging Management Evaluation
- Table 3.2.2-4 High Pressure Coolant Injection System—Summary of Aging Management Evaluation
- Table 3.2.2-5 Reactor Core Isolation Cooling 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 Primary Containment Penetrations—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 > 15% zinc
- gray cast iron
- stainless steel

Environment

Residual heat removal system components are exposed to the following environments.

- air – indoor
- raw water
- treated water
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the residual heat removal system require management.

- cracking
- cracking – fatigue
- fouling
- loss of material
- loss of material – wear

Aging Management Programs

The following aging management programs manage the effects of aging on the residual heat removal components.

- Bolting Integrity
- External Surfaces Monitoring
- One-Time Inspection
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Cooling Water

3.2.2.1.2 Core Spray

Materials

Core spray system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

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 core spray system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on the 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 Automatic Depressurization

Materials

Automatic depressurization system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Automatic depressurization system components are exposed to the following environments.

- air – indoor
- steam
- treated water

Aging Effects Requiring Management

The following aging effects associated with the automatic depressurization system require management.

- cracking – fatigue
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on the automatic depressurization system components.

- Bolting Integrity
- External Surfaces Monitoring
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Water Chemistry Control – BWR

3.2.2.1.4 High Pressure Coolant Injection

Materials

High pressure coolant injection system components are constructed of the following materials.

- carbon steel
- copper alloy

- copper alloy > 15% zinc
- copper alloy > 15% zinc (inhibited)
- glass
- stainless steel

Environment

High pressure coolant injection system components are exposed to the following environments.

- air – indoor
- air – untreated
- lube oil
- soil
- steam
- treated water
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the high pressure coolant injection system require management.

- cracking
- cracking – fatigue
- fouling
- loss of material
- loss of material – wear

Aging Management Programs

The following aging management programs manage the effects of aging on the high pressure coolant injection system components.

- Bolting Integrity
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring
- Heat Exchanger Monitoring
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Water Chemistry Control – BWR

3.2.2.1.5 Reactor Core Isolation Cooling

Materials

Reactor core isolation cooling system components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc
- glass
- stainless steel

Environment

Reactor core isolation cooling system components are exposed to the following environments.

- air – indoor
- air – outdoor
- lube oil
- soil
- steam
- treated water
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the reactor core isolation cooling system require management.

- cracking
- cracking – fatigue
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on the reactor core isolation cooling system components.

- Bolting Integrity
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring
- Oil Analysis
- 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
- copper alloy
- glass
- stainless steel

Environment

Standby gas treatment system components are exposed to the following environments.

- air – indoor
- condensation
- raw water
- soil
- steam

Aging Effects Requiring Management

The following aging effects associated with the standby gas treatment system require management.

- cracking
- cracking – fatigue
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on the standby gas treatment system components.

- Bolting Integrity
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Water Chemistry Control – BWR

3.2.2.1.7 Primary Containment Penetrations

Materials

Primary containment penetration components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Primary containment penetration components are exposed to the following environments.

- air – indoor
- gas
- raw water
- treated water

Aging Effects Requiring Management

The following aging effects associated with the primary containment penetrations require management.

- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on the primary containment penetrations components.

- Bolting Integrity
- External Surfaces Monitoring
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Water Chemistry Control – BWR

3.2.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 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 JAFNPP 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 item covers loss of material due to cladding breach on PWR steel pump casings. JAFNPP is a BWR and does not have charging pumps or steel pump casings with stainless steel cladding. This item is not applicable to JAFNPP.

3.2.2.2.3 Loss of Material due to Pitting and Crevice Corrosion

1. Loss of material due to pitting and crevice corrosion for internal surfaces of stainless steel piping and components in containment isolation components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

2. Loss of material from pitting and crevice corrosion for stainless steel piping and piping components exposed to a soil environment is managed by the Buried Piping and Tanks Inspection Program. The Buried Piping and Tanks Inspection Program will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel, copper alloy, gray cast iron, and stainless steel components. Buried components will be inspected when excavated during maintenance. An inspection will be performed within ten years of entering the period of extended operation, unless an opportunistic inspection occurred within this ten-year period.

3. Loss of material from pitting and crevice corrosion for BWR stainless steel piping and piping components exposed to treated water is managed by the Water Chemistry Control – BWR Program. There are no aluminum components exposed to treated water in the ESF systems. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection

Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

4. Loss of material from pitting and crevice corrosion could occur for copper alloy and stainless steel piping and components in ESF systems that are exposed to lubricating oil. Loss of material is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

5. Loss of material from pitting and crevice corrosion could occur for partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. At JAFNPP there are no outdoor stainless steel tanks in the ESF systems. This item is therefore not applicable.

6. Loss of material from pitting and crevice corrosion for ESF stainless steel components internally exposed to condensation at JAFNPP is managed by the One-Time Inspection Program. This program uses visual and other NDE techniques to confirm that loss of material is not occurring or is so insignificant that an aging management program for these components is not warranted.

3.2.2.2.4 Reduction of Heat Transfer due to Fouling

1. Reduction of heat transfer due to fouling for copper alloy heat exchanger tubes exposed to lubricating oil in ESF systems is managed by the Oil Analysis Program. There are no stainless steel or steel heat exchanger tubes exposed to lubricating oil in the ESF systems. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to fouling. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

2. Reduction of heat transfer due to fouling for stainless steel heat exchanger tubes exposed to treated water in ESF systems is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3.2.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

At JAFNPP there are no elastomeric components in the ESF systems. This item is not applicable to JAFNPP.

3.2.2.2.6 Loss of Material due to Erosion

This discussion refers to stainless steel high pressure safety injection (HPSI) pump miniflow recirculation orifice exposed to treated borated water. JAFNPP is a BWR and has no HPSI pump miniflow orifice and as such this item is not applicable.

3.2.2.2.7 Loss of Material due to General Corrosion and Fouling

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 air – indoor uncontrolled (internal). At JAFNPP the spray nozzles are copper alloy and are not subject to loss of material due to general corrosion in an indoor air environment. There are also no steel orifices in drywell and suppression chamber spray systems exposed to an indoor air environment (internal).

3.2.2.2.8 Loss of Material due to General, Pitting, and Crevice Corrosion

1. Loss of material due to general, pitting and crevice corrosion for BWR steel piping and components in ESF systems exposed to treated water is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow. The Periodic Surveillance and Preventive Maintenance Program supplements the Water Chemistry Control – BWR Program for components at the waterline in the suppression chamber and for components subject to erosion.

2. Loss of material due to general, pitting and crevice corrosion for primary containment penetration steel piping and components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of

components crediting this program including susceptible locations such as areas of stagnant flow.

3. Loss of material due to general, pitting and crevice corrosion for steel piping and components in ESF systems exposed to lubricating oil is managed by the Oil Analysis Program. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

3.2.2.2.9 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC)

Loss of material due to general, pitting, crevice, and MIC for steel (with or without coating or wrapping) piping buried in soil in ESF systems at JAFNPP is managed by the Buried Piping and Tanks Inspection Program. The Buried Piping and Tanks Inspection Program will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel components. Buried components will be inspected when excavated during maintenance. An inspection will be performed within ten years of entering the period of extended operation, unless an opportunistic inspection occurred within this ten-year period.

3.2.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of JAFNPP 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 3.2.2.1and 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, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-1	Steel and stainless steel piping, piping components, and piping elements in emergency core cooling system	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA. See Section 3.2.2.2.1.
3.2.1-2	PWR only				
3.2.1-3	Stainless steel containment isolation piping and components internal surfaces exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in stainless steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. See Section 3.2.2.2.3 item 1.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-4	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The Buried Piping and Tanks Inspection Program manages loss of material in stainless steel components exposed to soil. See Section 3.2.2.2.3 item 2.
3.2.1-5	Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in stainless steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. There are no aluminum components exposed to treated water in the ESF systems. See Section 3.2.2.2.3 item 3.
3.2.1-6	Stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages loss of material in stainless and copper alloy components. See Section 3.2.2.2.3 item 4.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-7	Partially encased stainless steel tanks with breached moisture barrier exposed to raw water	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated for pitting and crevice corrosion of tank bottoms because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering.	Yes, plant specific	Not applicable. There are no outdoor stainless steel tanks in the ESF systems. See Section 3.2.2.2.3 item 5.
3.2.1-8	Stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The One-Time Inspection Program confirm that loss of material is not occurring or is insignificant for internal stainless steel surfaces exposed to condensation in ESF systems. See Section 3.2.2.2.3 item 6.
3.2.1-9	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages reduction of heat transfer in copper alloy heat exchanger tubes. There are no stainless steel or steel heat exchanger tubes exposed to lube oil in the ESF systems. See Section 3.2.2.2.4 item 1.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-10	Stainless steel heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The reduction of heat transfer in stainless steel heat exchanger tubes is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. See Section 3.2.2.2.4 item 2.
3.2.1-11	Elastomer seals and components in standby gas treatment system exposed to air - indoor uncontrolled	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific 5)	Not applicable. There are no elastomeric components in the ESF systems. See Section 3.2.2.2.5.
3.2.1-12	PWR only				

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-13	Steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled (internal)	Loss of material due to general corrosion and fouling	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. There are no steel nozzles or flow orifices internally exposed to air in the drywell and suppression chamber spray flow paths. See Section 3.2.2.2.7.
3.2.1-14	Steel piping, piping components, and piping elements exposed to treated water	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. The Periodic Surveillance and Preventive Maintenance Program supplements water chemistry for components at the waterline in the suppression pool and for components subject to erosion. See Section 3.2.2.2.8 item 1.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-15	Steel containment isolation piping, piping components, and piping elements internal surfaces exposed to treated water	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. See Section 3.2.2.2.8 item 2.
3.2.1-16	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages loss of material in steel components exposed to lubricating oil. See Section 3.2.2.2.8 item 3.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-17	Steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	Consistent with NUREG-1801. The loss of material of buried steel piping will be managed by the Buried Piping and Tanks Inspection Program. See Section 3.2.2.2.9.
3.2.1-18	Stainless steel piping, piping components, and piping elements exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	The Water Chemistry Control – BWR Program manages cracking of stainless steel components. None of the ESF system components are within the scope of the BWR Stress Corrosion Cracking Program (all relevant components are included in the reactor vessel, internals and reactor coolant systems). The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-19	Steel piping, piping components, and piping elements exposed to steam or treated water	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	The Flow-Accelerated Corrosion and Periodic Surveillance and Preventive Maintenance Programs manage wall thinning in steel piping. The Periodic Surveillance and Preventive Maintenance Program provides augmented inspections for flow wall thinning.
3.2.1-20	Cast austenitic stainless steel piping, piping components, and piping elements exposed to treated water (borated or unborated) >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Not applicable. There are no CASS components in the ESF systems.
3.2.1-21	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable. High strength steel closure bolting is not used in ESF systems.
3.2.1-22	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity	No	Not applicable. All steel closure bolting exposed to air (external) is conservatively assumed to be exposed to indoor uncontrolled air (see Item Number 3.2.1-23).

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-23	Steel bolting and closure bolting exposed to air – outdoor (external), or air – indoor uncontrolled (external)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Consistent with NUREG-1801. The Bolting Integrity Program manages loss of material for steel bolting.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-24	Steel closure bolting exposed to air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Not applicable. Loss of preload is a design-driven effect and not an aging effect requiring management. Bolting at JAFNPP is standard grade B7 low alloy steel, or similar material, except in rare specialized applications such as where stainless steel bolting is utilized. Loss of preload due to stress relaxation (creep) would only be a concern in very high temperature applications (> 700°F) as stated in the ASME Code, Section II, Part D, Table 4. No JAFNPP bolting operates at > 700°F. Therefore, loss of preload due to stress relaxation (creep) is not an applicable aging effect for ESF systems. Other issues that may result in pressure boundary joint leakage are improper design or maintenance issues. Improper bolting application (design) and maintenance issues are current plant operational concerns and not related to aging effects or mechanisms that require management during the period of extended operation. (continued)

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					As described in the Bolting Integrity Program, JAFNPP has taken actions to address NUREG–1339, *Resolution to Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants.* These actions include implementation of good bolting practices in accordance with EPRI NP-5067, "Good Bolting Practices." Proper joint preparation and make-up in accordance with industry standards is expected to preclude loss of preload. This has been confirmed by operating experience at JAFNPP.
3.2.1-25	Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages cracking in stainless steel components exposed to closed cycle cooling water. The components to which this NUREG-1801 line item applies are in the reactor coolant system in Table 3.1.2-3.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-26	Steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	No	Not applicable. Steel containment isolation components exposed to closed cycle cooling water are part of other systems that are evaluated separately.
3.2.1-27	Steel heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for steel components.
3.2.1-28	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for stainless steel components.
3.2.1-29	Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for copper alloy components.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-30	Stainless steel and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Not applicable. There are no stainless steel or copper alloy heat exchanger tubes exposed to closed cycle cooling water with heat transfer as an intended function in the ESF systems.
3.2.1-31	External surfaces of steel components including ducting, piping, ducting closure bolting, and containment isolation piping external surfaces exposed to air - indoor uncontrolled (external); condensation (external) and air - outdoor (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The External Surfaces Monitoring Program manages loss of material for external surfaces of steel components.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-32	Steel piping and ducting components and internal surfaces exposed to air – indoor uncontrolled (Internal)	Loss of material due to general corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	The loss of material from the internal surfaces of steel components exposed to air – indoor is managed by the External Surfaces Monitoring, Fire Protection, Fire Water System, and One-Time Inspection Programs. The External Surfaces Monitoring Program manages loss of material for external carbon steel components by visual inspection of external surfaces. For systems where internal carbon steel surfaces are exposed to the same environment as external surfaces, external surface conditions will be representative of internal surfaces. Thus, loss of material on internal carbon steel surfaces is also managed by the External Surfaces Monitoring Program.
3.2.1-33	Steel encapsulation components exposed to air-indoor uncontrolled (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable. The ESF systems include no steel encapsulation components.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-34	Steel piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	The One-Time Inspection and Periodic Surveillance and Preventive Maintenance Programs manage loss of material for steel components exposed internally to condensation (untreated air in the high pressure coolant injection system).
3.2.1-35	Steel containment isolation piping and components internal surfaces exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	The Periodic Surveillance and Preventive Maintenance Program manages loss of material for steel containment isolation components exposed to raw water.
3.2.1-36	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801 for components of the residual heat removal system. The Service Water Integrity Program manages loss of material for carbon steel components exposed to raw water. For piping components of the standby gas treatment system, the Periodic Surveillance and Preventive Maintenance Program manages loss of material for carbon steel components exposed to raw water.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-37	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Service Water Integrity Program manages loss of material for stainless steel components exposed to raw water. The components to which this NUREG-1801 line item applies are in scope under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-14-xx tables.
3.2.1-38	Stainless steel containment isolation piping and components internal surfaces exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. There are no stainless steel containment isolation components exposed to raw water in the ESF systems.
3.2.1-39	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Service Water Integrity Program manages loss of material for stainless steel heat exchanger components exposed to raw water.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-40	Steel and stainless steel heat exchanger tubes (serviced by open-cycle cooling water) exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Service Water Integrity Program manages reduction of heat transfer for stainless steel heat exchanger tubes exposed to raw water. There are no steel heat exchanger tubes exposed to raw water in the ESF systems.
3.2.1-41	Copper alloy >15% Zn piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. The Selective Leaching Program will manage loss of material due to selective leaching for copper alloy > 15% zinc components exposed to closed cycle cooling water. It will also manage loss of material due to selective leaching for copper alloy > 15% zinc components exposed to treated water.
3.2.1-42	Gray cast iron piping, piping components, piping elements exposed to closed-cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. The Selective Leaching Program will manage loss of material due to selective leaching for gray cast iron components exposed to closed cycle cooling water.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-43	Gray cast iron piping, piping components, and piping elements exposed to soil	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no gray cast iron components exposed to soil in the ESF systems.
3.2.1-44	Gray cast iron motor cooler exposed to treated water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no gray cast iron motor cooler components exposed to treated water in the ESF systems.
3.2.1-45	PWR only				
3.2.1-46	PWR only				
3.2.1-47	PWR only				
3.2.1-48	PWR only				
3.2.1-49	PWR only				
3.2.1-50	Aluminum piping, piping components, and piping elements exposed to air-indoor uncontrolled (internal/external)	None	None	NA - No AEM or AMP	There are no aluminum components exposed to indoor air in the ESF systems. The only components to which this NUREG-1801 line item applies are in the auxiliary systems.
3.2.1-51	Galvanized steel ducting exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. Galvanized steel surfaces are evaluated as steel for the ESF systems.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-52	Glass piping elements exposed to air – indoor uncontrolled (external), lubricating oil, raw water, treated water, or treated borated water	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.2.1-53	Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801 for stainless steel and copper alloy components. There are no nickel alloy components exposed to air in the ESF systems.
3.2.1-54	Steel piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. There are no steel components of the ESF systems in indoor controlled air environments. All indoor air environments are conservatively considered to be uncontrolled.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-55	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Not applicable. There are no steel or stainless steel components in ESF systems embedded in concrete.
3.2.1-56	Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801 for stainless steel components exposed to gas in the ESF systems and for steel components exposed to gas in the reactor coolant system. There are no copper alloy components exposed to gas in the ESF systems.
3.2.1-57	PWR only				

Notes for Tables 3.2.2-1 through 3.2.2-7

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 untreated air environment is the equivalent of the NUREG-1801 defined condensation.

202. This treated water environment is the equivalent of the NUREG-1801 defined closed cycle cooling water.

203. The Periodic Surveillance and Preventive Maintenance Program applies to the piping and T-quenchers at the suppression pool waterline.

204. Portions of the system piping are subject to erosion. This piping is included in augmented inspections for flow-accelerated corrosion as part of the Periodic Surveillance and Preventive Maintenance Program.

205. This treated water environment encompasses both the closed cycle cooling water and the treated water environments as defined by NUREG-1801.

206. The One-Time Inspection Program will verify effectiveness of the Water Chemistry Control – BWR Program.

Table 3.2.2-1
Residual Heat Removal System
Summary of Aging Management

Table 3.2.2-1: Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Bolting	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206
Cyclone separator	Pressure boundary, Filtration	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Cyclone separator	Pressure boundary, Filtration	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Cyclone separator	Pressure boundary, Filtration	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Cyclone separator	Pressure boundary, Filtration	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206

Table 3.2.2-1: Residual Heat Removal System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2-8 (E-18)	3.2.1-36	B
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206

Table 3.2.2-1: Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	V.D1-20 (EP-52)	3.2.1-42	C, 202
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	V.D2-7 (E-17)	3.2.1-27	B
Heat exchanger (tubes)	Heat transfer	Stainless steel	Raw water (int)	Fouling	Service Water Integrity	V.D2-12 (E-21)	3.2.1-40	B
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water > 140°F (ext)	Fouling	Water Chemistry Control – BWR	V.D2-13 (EP-34)	3.2.1-10	A, 206
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2-6 (E-20)	3.2.1-39	B
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	V.D2-5 (E-19)	3.2.1-28	B
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (ext)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E

Table 3.2.2-1: Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (ext)	Loss of material – wear	Service Water Integrity			H
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Nozzle	Pressure boundary, Flow control	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Nozzle	Pressure boundary, Flow control	Copper alloy > 15% Zn	Air – indoor (int)	None	None			G
Orifice	Pressure boundary, Flow control	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E

Table 3.2.2-1: Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206

Table 3.2.2-1: Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Strainer	Filtration	Stainless steel	Treated water > 140°F (ext)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Strainer	Filtration	Stainless steel	Treated water > 140°F (ext)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Strainer	Filtration	Stainless steel	Treated water > 140°F (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-1: Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Tubing	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Tubing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Tubing	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	V.D2-23 (EP-27)	3.2.1-41	A, 205
Tubing	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C, 315
Tubing	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	V.D2-21 (EP-36)	3.2.1-29	B

Table 3.2.2-1: Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C

Table 3.2.2-1: Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206

Table 3.2.2-2
Core Spray System
Summary of Aging Management

Table 3.2.2-2: Core Spray System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Cyclone separator	Pressure boundary, Filtration	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Cyclone separator	Pressure boundary, Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Orifice	Pressure boundary, Flow control	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.2.2-2: Core Spray System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-33 (E-08)	3.2.1-14	E, 204
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206

Table 3.2.2-2: Core Spray System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206

Table 3.2.2-3
Automatic Depressurization System
Summary of Aging Management

Table 3.2.2-3: Automatic Depressurization System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-33 (E-08)	3.2.1-14	E, 203
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-33 (E-08)	3.2.1-14	E, 203

Table 3.2.2-3: Automatic Depressurization System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
T-quencher	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
T-quencher	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-33 (E-08)	3.2.1-14	E, 203
T-quencher	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
T-quencher	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-33 (E-08)	3.2.1-14	E, 203
T-quencher	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
T-quencher	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			G
T-quencher	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
T-quencher	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206

Table 3.2.2-3: Automatic Depressurization System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.D2-16 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C

Table 3.2.2-4
High Pressure Coolant Injection System
Summary of Aging Management

Table 3.2.2-4: High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bearing housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Bearing housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Blower housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Blower housing	Pressure boundary	Stainless steel	Air – untreated (int)	Loss of material	One-Time Inspection	V.D2-35 (E-14)	3.2.1-8	E, 201
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Bolting	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206
Drain pot	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-4: High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Drain pot	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Drain pot	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Gear box housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Gear box housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Governor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Governor housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E

Table 3.2.2-4: High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Lube oil (ext)	Fouling	Oil Analysis	V.D2-9 (EP-47)	3.2.1-9	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Treated water (ext)	Fouling	Water Chemistry Control – BWR	VIII.E-10 (SP-58)	3.4.1-9	C, 401
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Treated water (int)	Fouling	Water Chemistry Control – BWR	VIII.E-10 (SP-58)	3.4.1-9	C, 401

Table 3.2.2-4: High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Lube oil (ext)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Lube oil (ext)	Loss of material – wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C, 315
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (ext)	Loss of material – wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C, 315
Orifice	Pressure boundary, Flow control	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Orifice	Pressure boundary, Flow control	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Orifice	Pressure boundary, Flow control	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.2.2-4: High Pressure Coolant Injection System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary, Flow control	Stainless steel	Air – indoor (int)	None	None			G
Orifice	Pressure boundary, Flow control	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C, 401
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.B2-2 (SP-46)	3.4.1-37	C
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-4: High Pressure Coolant Injection System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air – untreated (int)	Loss of material	One-Time Inspection	V.D2-17 (E-27)	3.2.1-34	E, 201
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-33 (E-08)	3.2.1-14	E, 204
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.2.2-4: High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	V.D2-27 (EP-31)	3.2.1-4	E
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Rupture disk	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Rupture disk	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Rupture disk	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C, 401
Rupture disk	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			G
Rupture disk	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C

Table 3.2.2-4: High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F-6 (EP-15)	3.2.1-52	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	V.F-7 (EP-16)	3.2.1-52	A
Steam trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-4: High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Thermowell	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C, 315
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C, 401
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			G

Table 3.2.2-4: High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Turbine casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Turbine casing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.D2-16 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C

Table 3.2.2-4: High Pressure Coolant Injection System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis			H
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1-24 (EP-51)	3.2.1-6	E
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206

Table 3.2.2-5
Reactor Core Isolation Cooling
Summary of Aging Management

Table 3.2.2-5: Reactor Core Isolation Cooling

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Bolting	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Flow meter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Flow meter housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Governor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-5: Reactor Core Isolation Cooling

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Governor housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Orifice	Pressure boundary, Flow control	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Orifice	Pressure boundary, Flow control	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Orifice	Pressure boundary, Flow control	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.2.2-5: Reactor Core Isolation Cooling

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Orifice	Pressure boundary, Flow control	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C, 401
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.B2-2 (SP-46)	3.4.1-37	C
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-31 (E-07)	3.2.1-19	E, 204

Table 3.2.2-5: Reactor Core Isolation Cooling

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-33 (E-08)	3.2.1-14	E, 204
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring			G
Piping	Pressure boundary	Stainless steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	V.D2-27 (EP-31)	3.2.1-4	E
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206

Table 3.2.2-5: Reactor Core Isolation Cooling

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F-6 (EP-15)	3.2.1-52	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	V.F-7 (EP-16)	3.2.1-52	A
Steam trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-5: Reactor Core Isolation Cooling

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Tank	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Cracking-fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C, 401

Table 3.2.2-5: Reactor Core Isolation Cooling

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
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.B2-2 (SP-46)	3.4.1-37	C
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Tubing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	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.B2-2 (SP-46)	3.4.1-37	C
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206

Table 3.2.2-5: Reactor Core Isolation Cooling

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Turbine casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Turbine casing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A

Table 3.2.2-5: Reactor Core Isolation Cooling

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1-24 (EP-51)	3.2.1-6	E
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C, 401
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.B2-2 (SP-46)	3.4.1-37	C
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206

Table 3.2.2-6
Standby Gas Treatment System
Summary of Aging Management

Table 3.2.2-6: Standby Gas Treatment System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Duct	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Fan housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E

Table 3.2.2-6: Standby Gas Treatment System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Filter	Filtration	Carbon steel	Condensation (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-17 (E-27)	3.2.1-34	E
Filter	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	V.E-10 (E-46)	3.2.1-31	A
Filter unit housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Filter unit housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Flow element	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-17 (E-27)	3.2.1-34	E
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Flow element	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Orifice	Pressure boundary, Flow control	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-6: Standby Gas Treatment System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary, Flow control	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-17 (E-27)	3.2.1-34	E
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-8 (E-18)	3.2.1-36	E
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	V.B-9 (E-42)	3.2.1-17	B
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-31 (E-07)	3.2.1-19	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401

Table 3.2.2-6: Standby Gas Treatment System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Piping	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-9 (A-44)	3.3.1-81	E
Piping	Pressure boundary	Copper alloy	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection			G
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Sight glass	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F-6 (EP-15)	3.2.1-52	A
Sight glass	Pressure boundary	Glass	Air – indoor (int)	None	None			G
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy	Air – indoor (int)	None	None			G
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.2.2-6: Standby Gas Treatment System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	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.B2-2 (SP-46)	3.4.1-37	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-17 (E-27)	3.2.1-34	E
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-8 (E-18)	3.2.1-36	E
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C

Table 3.2.2-6: Standby Gas Treatment System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-31 (E-07)	3.2.1-19	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401

Table 3.2.2-7
Primary Containment Penetrations
Summary of Aging Management Evaluation

Table 3.2.2-7: Primary Containment Penetrations								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.C-5 (E-22)	3.2.1-35	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C-6 (E-31)	3.2.1-15	A, 206
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Piping	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.2.2-7: Primary Containment Penetrations

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	V.F-15 (EP-22)	3.2.1-56	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C-4 (E-33)	3.2.1-3	A, 206
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.D2-16 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.C-5 (E-22)	3.2.1-35	E
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C-6 (E-31)	3.2.1-15	A, 206
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Valve body	Pressure boundary	Stainless steel	Gas (int)	None	None	V.F-15 (EP-22)	3.2.1-56	A

Table 3.2.2-7: Primary Containment Penetrations

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C-4 (E-33)	3.2.1-3	A, 206

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).

- standby liquid control (Section 2.3.3.1)
- service water (Section 2.3.3.2)
- emergency diesel generator (Section 2.3.3.3)
- fuel oil (Section 2.3.3.4)
- fire protection – water (Section 2.3.3.5)
- fire protection – CO_2 (Section 2.3.3.6)
- heating, ventilation and air conditioning (Section 2.3.3.7)
- containment purge, containment atmosphere dilution and post-accident sampling (Section 2.3.3.8)
- fuel pool cooling and cleanup (Section 2.3.3.9)
- service, instrument and breathing air (Section 2.3.3.10)
- reactor building closed loop cooling water (Section 2.3.3.11)
- radwaste and plant drains (Section 2.3.3.12)
- security generator (Section 2.3.3.13)
- miscellaneous systems in scope for 10 CFR 54.4(a)(2) (Section 2.3.3.14)

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 Standby Liquid Control System—Summary of Aging Management Evaluation
- Table 3.3.2-2 Service Water Systems—Summary of Aging Management Evaluation
- Table 3.3.2-3 Emergency Diesel Generator System—Summary of Aging Management Evaluation
- Table 3.3.2-4 Fuel Oil System—Summary of Aging Management Evaluation

- Table 3.3.2-5 Fire Protection – Water System—Summary of Aging Management Evaluation
- Table 3.3.2-6 Fire Protection – CO2 System—Summary of Aging Management Evaluation
- Table 3.3.2-7 Heating, Ventilation and Air Conditioning Systems—Summary of Aging Management Evaluation
- Table 3.3.2-8 Containment Purge, Containment Atmosphere Dilution and Post-Accident Sampling Systems—Summary of Aging Management Evaluation
- Table 3.3.2-9 Fuel Pool Cooling and Cleanup System—Summary of Aging Management Evaluation
- Table 3.3.2-10 Service, Instrument and Breathing Air Systems—Summary of Aging Management Evaluation
- Table 3.3.2-11 Reactor Building Closed Loop Cooling Water System—Summary of Aging Management Evaluation
- Table 3.3.2-12 Radwaste and Plant Drains—Summary of Aging Management Evaluation
- Table 3.3.2-13 Security Generator—Summary of Aging Management Evaluation

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

- Table 3.3.2-14-1 Gas Handling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-2 Reactor Coolant System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-3 Control Rod Drive System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-4 Residual Heat Removal System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-5 Standby Liquid Control System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.3.2-14-6 Reactor Water Cleanup System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-7 Reactor Core Isolation Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-8 Core Spray System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-9 Reactor Building Closed Loop Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-10 Primary Containment System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-11 Process Radiation Monitors, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-12 Fuel Pool Cooling and Cleanup System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-13 Radwaste System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-14 High Pressure Coolant Injection System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-15 Containment Purge/CAD/PASS System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-16 Main Steam System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-17 Extraction Steam System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.3.2-14-18 Decay Heat Removal System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-19 Condensate System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-20 Feedwater System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-21 Feedwater Heater Vents and Drains System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-22 Circulating Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-23 Turbine Building Closed Loop Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-24 Vacuum Priming and Air Removal System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-25 Service/Instrument/Breathing Air System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-26 Turbine Lube Oil System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-27 Secondary Plant Drains, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-28 Raw Water Treatment System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-29 Contaminated Equipment Drains, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.3.2-14-30 Service Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-31 Auxiliary Gas Treatment System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-32 Reactor Building Ventilation System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-33 Turbine Building Ventilation System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-34 Drywell Ventilation and Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-35 Administration Building Ventilation and Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-36 Screenwell/Water Treatment Ventilation and Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-37 Plumbing, Sanitary, and Lab, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-38 Fire Protection System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-39 City Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-40 Auxiliary Boiler and Accessories, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-41 Emergency Diesel Generator, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.3.2-14-42 Main Turbine Generator, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-43 Sample System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-44 Steam Seal 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 Standby Liquid Control

Materials

Standby liquid control system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Standby liquid control system components are exposed to the following environments.

- air – indoor
- concrete
- sodium pentaborate

Aging Effects Requiring Management

The following aging effects associated with the standby liquid control system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the standby liquid control system components.

- Bolting Integrity
- One-Time Inspection
- Water Chemistry Control – BWR

3.3.2.1.2 Service Water

Materials

Service water system components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc
- gray cast iron
- stainless steel

Environment

Service water system components are exposed to the following environments.

- condensation
- lube oil
- raw water
- treated water

Aging Effects Requiring Management

The following aging effects associated with the service water system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the service water system components.

- Bolting Integrity
- External Surfaces Monitoring
- Oil Analysis
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – Closed Cooling Water

3.3.2.1.3 Emergency Diesel Generator

Materials

Emergency diesel generator system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy
- copper alloy > 15% zinc (inhibited)
- copper alloy > 15% zinc
- elastomer
- glass
- gray cast iron
- stainless steel

Environment

Emergency diesel generator system components are exposed to the following environments.

- air – indoor
- air – outdoor
- air – untreated
- exhaust gas
- lube oil
- raw water
- treated water

Aging Effects Requiring Management

The following aging effects associated with the emergency diesel generator system require management.

- change in material properties
- cracking
- cracking – fatigue
- fouling
- loss of material
- loss of material – wear

Aging Management Programs

The following aging management programs manage the aging effects for the emergency diesel generator system components.

- Bolting Integrity
- External Surfaces Monitoring
- Heat Exchanger Monitoring
- Oil Analysis
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – Closed Cooling Water

3.3.2.1.4 Fuel Oil

Materials

Fuel oil system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy
- copper alloy > 15% zinc
- gray cast iron
- stainless steel

Environment

Fuel oil system components are exposed to the following environments.

- air – indoor
- air – outdoor
- concrete
- fuel oil
- soil

Aging Effects Requiring Management

The following aging effects associated with the fuel oil system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the fuel oil system components.

- Bolting Integrity
- Buried Piping and Tanks Inspection
- Diesel Fuel Monitoring
- External Surfaces Monitoring
- Fire Protection

3.3.2.1.5 Fire Protection – Water

Materials

Fire protection – water system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy
- copper alloy > 15% zinc
- glass
- gray cast iron
- stainless steel

Environment

Fire protection – water system components are exposed to the following environments.

- air – indoor
- air – outdoor
- exhaust gas
- fire protection foam
- lube 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 material – wear

Aging Management Programs

The following aging management programs manage the aging effects for the fire protection – water system components.

- Bolting Integrity
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring
- Fire Protection
- Fire Water System
- Oil Analysis
- Selective Leaching

3.3.2.1.6 Fire Protection – CO_2

Materials

Fire protection – CO_2 system components are constructed of the following materials.

- carbon steel
- copper alloy
- copper alloy > 15% zinc
- stainless steel

Environment

Fire protection – CO_2 system components are exposed to the following environments.

- air – indoor
- gas

Aging Effects Requiring Management

The following aging effects associated with the fire protection – CO_2 system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the fire protection – CO_2 system components.

- Bolting Integrity
- Fire Protection

3.3.2.1.7 Heating, Ventilation and Air Conditioning

Materials

Heating, ventilation and air conditioning system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy
- copper alloy > 15% zinc
- elastomer
- glass
- gray cast iron
- nickel alloy
- stainless steel

Environment

Heating, ventilation and air conditioning system components are exposed to the following environments.

- air – indoor
- air – outdoor
- condensation
- gas
- raw water
- treated water

Aging Effects Requiring Management

The following aging effects associated with the heating, ventilation and air conditioning system require management.

- change in material properties
- cracking
- fouling
- loss of material
- loss of material – wear

Aging Management Programs

The following aging management programs manage the aging effects for the heating, ventilation and air conditioning systems components.

- Bolting Integrity
- External Surfaces Monitoring
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – Auxiliary Systems

3.3.2.1.8 Containment Purge, Containment Atmosphere Dilution and Post-Accident Sampling

Materials

Containment purge, containment atmosphere dilution and post-accident sampling system components are constructed of the following materials.

- aluminum
- carbon steel
- stainless steel

Environment

Containment purge, containment atmosphere dilution and post-accident sampling system components are exposed to the following environments.

- air – indoor
- condensation
- gas
- liquid nitrogen
- vacuum

Aging Effects Requiring Management

The following aging effects associated with the containment purge, containment atmosphere dilution and post-accident sampling system require management.

- fouling
- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the containment purge, containment atmosphere dilution and post-accident sampling system components.

- Bolting Integrity
- External Surfaces Monitoring
- Periodic Surveillance and Preventive Maintenance

3.3.2.1.9 Fuel Pool Cooling and Cleanup

Materials

Fuel pool cooling and cleanup system components are constructed of the following materials.

- aluminum/boron carbide
- 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.

- cracking
- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the fuel pool cooling and cleanup system components.

- Bolting Integrity
- External Surfaces Monitoring
- One-Time Inspection
- Water Chemistry Control – BWR

3.3.2.1.10 Service, Instrument and Breathing Air

Materials

Service, instrument and breathing air system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy
- copper alloy > 15% zinc
- stainless steel

Environment

Service, instrument and breathing air system components are exposed to the following environments.

- air – indoor
- air – treated
- gas

Aging Effects Requiring Management

The following aging effects associated with the service, instrument and breathing air system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the service, instrument and breathing air system components.

- Bolting Integrity
- External Surfaces Monitoring

3.3.2.1.11 Reactor Building Closed Loop Cooling Water

Materials

Reactor building closed loop cooling water system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy
- copper alloy > 15% zinc
- stainless steel

Environment

Reactor building closed loop cooling water system components are exposed to the following environments.

- air – indoor
- gas
- treated water

Aging Effects Requiring Management

The following aging effects associated with the reactor building closed loop cooling water system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the reactor building closed loop cooling water system components.

- Bolting Integrity
- External Surfaces Monitoring
- Water Chemistry Control – Closed Cooling Water

3.3.2.1.12 Radwaste and Plant Drains

Materials

Radwaste and plant drains components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc
- fiberglass
- gray cast iron
- stainless steel

Environment

Radwaste and plant drains components are exposed to the following environments.

- air – indoor
- concrete
- raw water
- soil

Aging Effects Requiring Management

The following aging effects associated with the radwaste and plant drains require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the radwaste and plant drains components.

- Bolting Integrity
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching

3.3.2.1.13 Security Generator

Materials

Security generator components are constructed of the following materials.

- carbon steel
- copper alloy
- copper alloy > 15% zinc
- stainless steel

Environment

Security generator components are exposed to the following environments.

- air – indoor
- air – outdoor
- exhaust gas
- gas
- lube oil
- soil
- treated water

Aging Effects Requiring Management

The following aging effects associated with the security generator require management.

- cracking – fatigue
- fouling
- loss of material
- loss of material – wear

Aging Management Programs

The following aging management programs manage the aging effects for the security generator components.

- Bolting Integrity
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring
- Oil Analysis
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Water Chemistry Control – Auxiliary Systems

3.3.2.1.14 Miscellaneous 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 3.3.2-14-xx tables.

Materials

Nonsafety-related components affecting safety-related systems are constructed of the following materials.

- aluminum
- carbon steel
- carbon steel with plastic liner
- copper alloy
- copper alloy > 15% zinc
- glass
- gray cast iron
- plastic
- stainless steel

Environment

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- air – indoor
- air – outdoor
- air – treated
- air – untreated
- condensation
- fuel oil
- gas
- lube oil
- raw water
- sodium pentaborate solution
- steam
- 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

Aging Management Programs

The following aging management programs manage the effects of aging on nonsafety-related components affecting safety-related systems.

- Bolting Integrity
- Diesel Fuel Monitoring
- External Surfaces Monitoring
- Fire Water System
- Flow-Accelerated Corrosion
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – Auxiliary Systems
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Cooling Water

3.3.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 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 JAFNPP 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.

Where fatigue damage is identified as an aging effect requiring management for components with no fatigue design requirements, the aging effect is managed by inspection. The Periodic Surveillance and Preventive Maintenance, Fire Protection, and One-Time Inspection programs will manage cracking due to fatigue for these components.

3.3.2.2.2 Reduction of Heat Transfer due to Fouling

Reduction of heat transfer due to fouling is an aging effect requiring management for stainless steel heat exchanger tubes exposed to treated water. At JAFNPP there are no stainless steel heat exchanger tubes exposed to treated water in the auxiliary systems with an intended function of heat transfer. This item is not applicable to JAFNPP.

3.3.2.2.3 Cracking due to Stress Corrosion Cracking (SCC)

1. Cracking due to SCC can occur in the stainless steel piping, piping components, and piping elements of the BWR standby liquid control (SLC) system that are exposed to sodium pentaborate solution greater than 140°F. At JAFNPP the sodium pentaborate solution in the SLC system does not exceed 140°F. Therefore, cracking due to SCC is not an aging effect requiring management for the SLC system. This item is not applicable to JAFNPP.

2. Cracking due to SCC in stainless steel heat exchanger components exposed to treated water greater than 140°F is an aging effect requiring management at JAFNPP. For JAFNPP auxiliary systems, these stainless steel heat exchanger components are managed by the Water Chemistry Control – BWR Program. This program monitors parameters and contaminants to ensure they remain within the limits specified by the EPRI guidelines. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program

through an inspection of a representative sample of components crediting this program for managing cracking using visual and ultrasonic inspection techniques.

3. Cracking due to SCC can occur in stainless steel diesel engine exhaust piping exposed to diesel exhaust when moisture can collect inside the component when the diesel is not in operation. At JAFNPP, the stainless steel exhaust components are oriented vertically, which precludes pooling of water. Therefore, cracking due to SCC is not an aging effect requiring management for the stainless steel diesel engine exhaust piping. This item is not applicable to JAFNPP.

3.3.2.2.4 Cracking due to Stress Corrosion Cracking and Cyclic Loading

1. Cracking due to SCC and cyclic loading could occur in stainless steel PWR nonregenerative heat exchanger components exposed to treated borated water greater than 140°F in the chemical and volume control system. JAFNPP is a BWR and does not have a nonregenerative heat exchanger exposed to treated borated water. This item is not applicable to JAFNPP.

2. Cracking due to SCC and cyclic loading could occur in stainless steel PWR regenerative heat exchanger components exposed to treated borated water greater than 140°F. JAFNPP is a BWR and does not have a regenerative heat exchanger exposed to treated borated water. This item is not applicable to JAFNPP.

3. Cracking due to SCC and cyclic loading could occur in the stainless steel pump casing of PWR high-pressure pumps in the chemical and volume control system. JAFNPP is a BWR and does not have a chemical and volume control system. This item is not applicable to JAFNPP.

3.3.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

1. Cracking and change in material properties due to elastomer degradation in elastomer flexible connections of auxiliary systems and other systems exposed to air – indoor are aging effects requiring management at JAFNPP. These aging effects are managed by the Periodic Surveillance and Preventive Maintenance Program. This program includes visual inspections and physical manipulation of the flexible connections to confirm that the components are not experiencing any aging that would affect accomplishing their intended functions.

2. For the auxiliary systems at JAFNPP no credit is taken for any elastomer linings to prevent loss of material from the underlying carbon steel material. The material is identified as carbon steel for the aging management review. This item is not applicable to JAFNPP.

3.3.2.2.6 Reduction of Neutron-Absorbing Capacity and Loss of Material due to General Corrosion

Loss of material and cracking are aging effects requiring management for Boral spent fuel storage racks exposed to a treated water environment. These aging effects are managed by the Water Chemistry Control – BWR Program.

Reduction of neutron-absorbing capacity is insignificant and requires no aging management. The potential for aging effects due to sustained irradiation of Boral was previously evaluated by the staff (BNL-NUREG-25582, dated January 1979; NUREG-1787, VC Summer SER, paragraph 3.5.2.4.2, page 3-408) and determined to be insignificant. Plant operating experience with Boral coupons inspected in 2005 is consistent with the staff's conclusion and an aging management program is not required for this effect.

3.3.2.2.7 Loss of Material due to General, Pitting, and Crevice Corrosion

1. Steel piping and components in auxiliary systems at JAFNPP that are exposed to lubricating oil are managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

   JAFNPP is a BWR with an inert containment atmosphere and as a result has no reactor coolant pump oil collection system.

2. JAFNPP does not have a separate shutdown cooling system. Loss of material due to general, pitting, and crevice corrosion in carbon steel piping and components in other systems exposed to treated water are managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3. Loss of material due to general (steel only) pitting and crevice corrosion for carbon steel and stainless steel diesel exhaust piping and components exposed to diesel exhaust in the emergency diesel generator and security generator systems is

managed by the Periodic Surveillance and Preventive Maintenance (PSPM) Program. This program uses visual and other NDE techniques to manage loss of material for these components. The carbon steel and stainless steel diesel exhaust piping and components in the fire protection system are managed by the Fire Protection Program. The Fire Protection Program uses visual inspections of diesel exhaust piping and components to manage loss of material. These inspections in the PSPM and Fire Protection Program will manage the aging effect of loss of material such that the intended function of the components will not be affected.

3.3.2.2.8 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC)

Loss of material due to general, pitting, crevice, and MIC for carbon steel (with or without coating or wrapping) piping and components buried in soil in the auxiliary systems at JAFNPP is managed by the Buried Piping and Tanks Inspection Program. This program will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel components. Buried components will be inspected when excavated during maintenance. An inspection will be performed within ten years of entering the period of extended operation, unless an opportunistic inspection occurred within this ten-year period. This program will manage the aging effect of loss of material such that the intended function of the components will not be affected.

3.3.2.2.9 Loss of Material due to General, Pitting, Crevice, Microbiologically-Influenced Corrosion and Fouling

1. Loss of material due to general, pitting, crevice, and MIC for carbon steel piping and components exposed to fuel oil is an aging effect requiring management at JAFNPP and these components are managed by the Diesel Fuel Monitoring Program. This program includes sampling and monitoring of fuel oil quality to ensure they remain within the limits specified by the ASTM standards. Maintaining parameters within limits ensures that significant loss of material will not occur. Ultrasonic inspection of storage tank bottoms where water and contaminants accumulate will be performed to confirm the effectiveness of the Diesel Fuel Monitoring Program. In addition, inspections of components during the previous five years at JAFNPP have confirmed the effectiveness of this program in lieu of a one-time inspection program such that loss of material will not affect the intended functions of these components.

2. Loss of material due to general, pitting, crevice and MIC for carbon steel heat exchanger components exposed to lubricating oil is an aging effect requiring management in the auxiliary systems at JAFNPP and is managed by the Oil Analysis Program. This program includes periodic sampling and analysis of

lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

3.3.2.2.10 Loss of Material due to Pitting and Crevice Corrosion

1. Loss of material due to pitting and crevice corrosion could occur in steel piping with elastomer lining or stainless steel cladding that is exposed to treated water and treated borated water if the cladding or lining is degraded. For the auxiliary systems at JAFNPP, no credit is taken for elastomer linings or stainless steel cladding to prevent loss of material from the underlying carbon steel material when exposed to treated water or treated borated water; the material is identified as carbon steel for the aging management review. The Water Chemistry Control – BWR Program manages loss of material in steel components exposed to treated water. The effectiveness of the program will be confirmed by the One-Time Inspection Program.

2. In the auxiliary systems at JAFNPP there are no aluminum components exposed to treated water. Loss of material due to pitting and crevice corrosion for stainless steel piping and components and for stainless steel heat exchanger components exposed to treated water in the auxiliary systems at JAFNPP is managed by the Water Chemistry Control – BWR Program. The effectiveness of the program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3. Loss of material due to pitting and crevice corrosion for copper alloy components exposed to condensation (external) in the HVAC and other systems is managed by the External Surfaces Monitoring, Periodic Surveillance and Preventive Maintenance (PSPM) and Service Water Integrity Programs. The External Surfaces Monitoring Program includes a periodic visual inspection. The PSPM and Service Water Integrity Programs include visual inspections and other NDE techniques to manage loss of material of the components. These inspections will manage the aging effect of loss of material such that the intended function of the components will not be affected.

4. Loss of material due to pitting and crevice corrosion for copper alloy components exposed to lubricating oil in auxiliary systems at JAFNPP is managed by the Oil

Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

5. Loss of material due to pitting and crevice corrosion for aluminum piping and components and stainless steel components exposed to condensation is an aging effect requiring management for HVAC and other systems at JAFNPP. The Bolting Integrity, External Surfaces Monitoring, Periodic Surveillance and Preventive Maintenance and Service Water Integrity Programs will manage loss of material in aluminum or stainless steel components exposed internally or externally to condensation. These programs include a periodic visual inspection and the PSPM program includes other NDE techniques to manage loss of material of the components.

6. Loss of material due to pitting and crevice corrosion could occur for copper alloy fire protection system piping, piping components, and piping elements exposed to internal condensation. At JAFNPP there are no copper alloy components exposed to condensation in the fire protection systems. However, this item can be applied to copper alloy components exposed to internal condensation in other systems. The Periodic Surveillance and Preventive Maintenance and One-Time Inspection Programs will manage loss of material or confirm the aging effect is absent or insignificant in copper alloy components exposed internally to untreated air, which is equivalent to condensation, through the use of visual inspections or other NDE techniques.

7. Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, and piping elements exposed to soil. At JAFNPP there are no stainless steel piping components exposed to soil in the auxiliary systems. This item is not applicable to JAFNPP.

8. Loss of material due to pitting and crevice corrosion for stainless steel piping and components of the standby liquid control system exposed to sodium pentaborate solution is managed at JAFNPP by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3.3.2.2.11 Loss of Material due to Pitting, Crevice and Galvanic Corrosion

Loss of material due to pitting, crevice, and galvanic corrosion for copper alloy piping and components exposed to treated water in the auxiliary and other systems at JAFNPP is managed by the Water Chemistry Control – BWR Program. The effectiveness of the program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3.3.2.2.12 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

1. Loss of material due to pitting, crevice, and MIC in stainless steel and copper alloy piping and components exposed to fuel oil is an aging effect requiring management at JAFNPP and these components are managed by the Diesel Fuel Monitoring Program. There are no aluminum components exposed to fuel oil in the auxiliary systems. The Diesel Fuel Monitoring Program includes sampling and monitoring of fuel oil quality to ensure it remains within the limits specified by the ASTM standards. Maintaining parameters within limits ensures that significant loss of material will not occur. Inspections of components during the previous five years at JAFNPP have confirmed the effectiveness of this program in lieu of a one-time inspection program such that loss of material will not affect the intended functions of these components.

2. Loss of material due to pitting, crevice, and MIC in stainless steel piping and components exposed to lubricating oil is managed by the Oil Analysis Program which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

3.3.2.2.13 Loss of Material due to Wear

Loss of material due to wear could occur in the elastomer seals and components exposed to air – indoor uncontrolled (internal or external). Wear is the removal of surface layers due to relative motion between two surfaces. At JAFNPP, in the auxiliary systems, this specific aging effect for elastomers is not applicable since the expansion joints are fixed at both ends and do not contact any other components such that wear could occur. Where the aging effects of change in material properties and cracking are identified for elastomer components, they are managed by the

Periodic Surveillance and Preventive Maintenance Program. This item is not applicable to JAFNPP auxiliary systems.

3.3.2.2.14 Cracking due to Underclad Cracking

Cracking due to underclad cracking could occur for PWR steel charging pump casings with stainless steel cladding exposed to treated borated water. JAFNPP is a BWR and has no charging pumps. This item is not applicable to JAFNPP.

3.3.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of JAFNPP 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, NUREG-1801 Vol. 1					
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	TLAA to be evaluated for structural girders of cranes. See the Standard Review Plan, Section 4.7 for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	This line item was not used. Steel cranes are evaluated as structural components in Section 3.5.
3.3.1-2	Steel and stainless steel piping, piping components, piping elements, and heat exchanger components exposed to air – indoor uncontrolled, treated borated water or treated water	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA. See Section 3.3.2.2.1.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-3	Stainless steel heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no stainless steel heat exchanger tubes exposed to treated water in the auxiliary systems with an intended function of heat transfer. See Section 3.3.2.2.2.
3.3.1-4	Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. The operating temperature of the standby liquid control system is below the 140°F threshold for cracking in stainless steel. See Section 3.3.2.2.3 item 1.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-5	Stainless steel and stainless clad steel heat exchanger components exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Plant specific	Yes, plant specific	Cracking in stainless steel heat exchanger components exposed to treated water > 140°F is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. The components to which this NUREG-1801 line item applies are in scope under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-14-xx tables. See Section 3.3.2.2.3 item 2.
3.3.1-6	Stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust	Cracking due to stress corrosion cracking	Plant specific	Yes, plant specific	Not applicable. The configuration of stainless steel diesel exhaust components precludes cracking due to stress corrosion cracking. See Section 3.3.2.2.3 item 3.
3.3.1-7	PWR only				
3.3.1-8	PWR only				
3.3.1-9	PWR only				

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-10	High-strength steel closure bolting exposed to air with steam or water leakage.	Cracking due to stress corrosion cracking, cyclic loading	Bolting Integrity The AMP is to be augmented by appropriate inspection to detect cracking if the bolts are not otherwise replaced during maintenance.	Yes, if the bolts are not replaced during maintenance	Not applicable. High strength steel bolting is not used in the auxiliary systems.
3.3.1-11	Elastomer seals and components exposed to air – indoor uncontrolled (internal/external)	Hardening and loss of strength due to elastomer degradation	Plant specific	Yes, plant specific	The change in material properties of elastomer components will be managed by the Periodic Surveillance and Preventive Maintenance Program. See Section 3.3.2.2.5 item 1.
3.3.1-12	Elastomer lining exposed to treated water or treated borated water	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program that determines and assesses the qualified life of the linings in the environment is to be evaluated.	Yes, plant specific	Not applicable. No credit is taken for any elastomer linings to prevent loss of material from the underlying carbon steel. See Section 3.3.2.2.5 item 2.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-13	Boral, boron steel spent fuel storage racks neutron-absorbing sheets exposed to treated water or treated borated water	Reduction of neutron-absorbing capacity and loss of material due to general corrosion	Plant specific	Yes, plant specific	The Water Chemistry Control – BWR Program manages the degradation of Boral. Reduction of neutron-absorbing capacity is insignificant and requires no aging management. See Section 3.3.2.2.6.
3.3.1-14	Steel piping, piping component, and piping elements exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages loss of material in steel components. See Section 3.3.2.2.7 item 1.
3.3.1-15	Steel reactor coolant pump oil collection system piping, tubing, and valve bodies exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. Reactor coolant pump oil collection components are not required. JAFNPP operates with an inerted containment. See Section 3.3.2.2.7 item 1.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-16	Steel reactor coolant pump oil collection system tank exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection to evaluate the thickness of the lower portion of the tank	Yes, detection of aging effects is to be evaluated	Not applicable. Reactor coolant pump oil collection components are not required. JAFNPP operates with an inerted containment. See Section 3.3.2.2.7 item 1.
3.3.1-17	Steel piping, piping components, and piping elements exposed to treated water	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. See Section 3.3.2.2.7 item 2.
3.3.1-18	Stainless steel and steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust	Loss of material/ general (steel only), pitting and crevice corrosion	Plant specific	Yes, plant specific	The Periodic Surveillance and Preventive Maintenance and Fire Protection Programs will manage loss of material in steel and stainless steel components exposed to diesel exhaust. See Section 3.3.2.2.7 item 3.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-19	Steel (with or without coating or wrapping) piping, piping components, and piping elements exposed to soil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	Consistent with NUREG-1801. The loss of material of buried steel components will be managed by the Buried Piping and Tanks Inspection Program. See Section 3.3.2.2.8.
3.3.1-20	Steel piping, piping components, piping elements, and tanks exposed to fuel oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Diesel Fuel Monitoring Program manages loss of material in steel components. See Section 3.3.2.2.9 item 1.
3.3.1-21	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages loss of material in steel heat exchanger components. See Section 3.3.2.2.9 item 2.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-22	Steel with elastomer lining or stainless steel cladding piping, piping components, and piping elements exposed to treated water and treated borated water	Loss of material due to pitting and crevice corrosion (only for steel after lining/ cladding degradation)	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. No credit is taken for any elastomer linings or stainless steel cladding to prevent loss of material from the underlying carbon steel material. See Section 3.3.2.2.10 item 1.
3.3.1-23	Stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in stainless steel heat exchanger components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. The components to which this NUREG-1801 line item applies are in scope under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-14-xx tables. See Section 3.3.2.2.10 item 2.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1					
Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-24	Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in stainless steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. There are no aluminum piping components exposed to treated water in the auxiliary systems. See Section 3.3.2.2.10 item 2.
3.3.1-25	Copper alloy HVAC piping, piping components, piping elements exposed to condensation (external)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The External Surfaces Monitoring, Periodic Surveillance and Preventive Maintenance and Service Water Integrity Programs will manage loss of material in copper alloy components. See Section 3.3.2.2.10 item 3.
3.3.1-26	Copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages loss of material in copper alloy components. See Section 3.3.2.2.10 item 4.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-27	Stainless steel HVAC ducting and aluminum HVAC piping, piping components and piping elements exposed to condensation	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The Bolting Integrity, External Surfaces Monitoring, Periodic Surveillance and Preventive Maintenance and Service Water Integrity Programs manage loss of material in aluminum and stainless steel components. See Section 3.3.2.2.10 item 5.
3.3.1-28	Copper alloy fire protection piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The Periodic Surveillance and Preventive Maintenance and One-Time Inspection Programs will manage loss of material or confirm it is insignificant in copper alloy components. See Section 3.3.2.2.10 item 6.
3.3.1-29	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. There are no buried stainless steel components in the auxiliary systems. See Section 3.3.2.2.10 item 7.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-30	Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in stainless steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. See Section 3.3.2.2.10 item 8.
3.3.1-31	Copper alloy piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting, crevice, and galvanic corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in copper alloy components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. The components to which this NUREG-1801 line item applies are in the residual heat removal and high pressure coolant injection systems in Tables 3.2.2-1 and 3.2.2-4, and components in scope under criterion 10 CFR 54.4(a)(2), listed in series 3.3.2-14-xx tables. See Section 3.3.2.2.11.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-32	Stainless steel, aluminum and copper alloy piping, piping components, and piping elements exposed to fuel oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Diesel Fuel Monitoring Program manages loss of material in stainless steel and copper alloy components. There are no aluminum components exposed to fuel oil in the auxiliary systems. See Section 3.3.2.2.12 item 1.
3.3.1-33	Stainless steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages loss of material in stainless steel components. See Section 3.3.2.2.12 item 2.
3.3.1-34	Elastomer seals and components exposed to air – indoor uncontrolled (internal or external)	Loss of material due to Wear	Plant specific	Yes, plant specific	Not applicable. There are no elastomer components with loss of material due to wear as an applicable aging effect. See Section 3.3.2.2.13.
3.3.1-35	PWR only				

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-36	Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated water	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	No	Not applicable. Boraflex is not used in the JAFNPP spent fuel storage racks.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-37	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	BWR Reactor Water Cleanup System	No	Cracking of stainless steel components of the reactor water cleanup system is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. The only components to which this NUREG-1801 line item applies are included in scope only under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables. The BWR Reactor Water Cleanup System Program is not credited for license renewal. NUREG-1801 states that no IGSCC inspection is recommended for plants that have piping made of material that is resistant to IGSCC and that have satisfactorily completed all actions requested in NRC GL 89-10. Since JAFNPP satisfies these criteria, the Water Chemistry Control - BWR Program is used in lieu of the reactor water cleanup system program to manage cracking. As described in line 3.3.1-38, the One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-38	Stainless steel piping, piping components, and piping elements exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	The Water Chemistry Control – BWR Program manages cracking of stainless steel components. None of the auxiliary system components are within the scope of the BWR Stress Corrosion Cracking Program (all relevant components are included in the reactor vessel, internals and reactor coolant systems). The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. The only components to which this NUREG-1801 line item applies are included in scope only under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-14-xx tables.
3.3.1-39	Stainless steel BWR spent fuel storage racks exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry	No	Not applicable. There are no stainless steel spent fuel storage components with intended functions exposed to treated water > 140°F.
3.3.1-40	Steel tanks in diesel fuel oil system exposed to air - outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Not applicable. There are no outdoor steel tanks in the fuel oil system.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-41	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable. High-strength steel closure bolting is not used in the auxiliary systems.
3.3.1-42	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity	No	This line item was not used. Loss of material of steel closure bolting was addressed by other items including 3.3.1-43, 3.3.1-44, 3.3.1-55 and 3.3.1-58.
3.3.1-43	Steel bolting and closure bolting exposed to air – indoor uncontrolled (external) or air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Consistent with NUREG-1801. The Bolting Integrity Program manages the loss of material for steel bolting.
3.3.1-44	Steel compressed air system closure bolting exposed to condensation	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	The Bolting Integrity Program manages the loss of material for steel bolting. The only components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-14-xx tables.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-45	Steel closure bolting exposed to air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Not applicable. Loss of preload is a design-driven effect and not an aging effect requiring management. Bolting at JAFNPP is standard grade B7 low alloy steel, or similar material, except in rare specialized applications such as where stainless steel bolting is utilized. Loss of preload due to stress relaxation (creep) would only be a concern in very high temperature applications (> 700°F), as stated in the ASME Code, Section II, Part D, Table 4. No JAFNPP bolting operates at > 700°F. Therefore, loss of preload due to stress relaxation (creep) is not an applicable aging effect for auxiliary systems. Other issues that may result in pressure boundary joint leakage are improper design or maintenance issues. Improper bolting application (design) and maintenance issues are current plant operational concerns and not related to aging effects or mechanisms that require management during the period of extended operation. (continued)

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
					As described in the Bolting Integrity Program, JAFNPP has taken actions to address NUREG–1339, *Resolution to Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants*. These actions include implementation of good bolting practices in accordance with EPRI NP-5067, Good Bolting Practices. Proper joint preparation and make-up in accordance with industry standards is expected to preclude loss of preload. This has been confirmed by operating experience at JAFNPP.
3.3.1-46	Stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	The Water Chemistry Control – Closed Cooling Water and Water Chemistry Control – Auxiliary Systems Programs manage cracking for stainless steel components. The only components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-14-xx tables.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-47	Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	No	The Water Chemistry Control – Closed Cooling Water, Water Chemistry Control – Auxiliary Systems, Fire Protection, and Periodic Surveillance and Preventive Maintenance Programs manage loss of material for steel components.
3.3.1-48	Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	The Water Chemistry Control – Closed Cooling Water, Water Chemistry Control – Auxiliary Systems and Fire Protection Programs manage loss of material for steel heat exchanger components.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-49	Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water	Loss of material due to microbiologically influenced corrosion	Closed-Cycle Cooling Water System	No	The Water Chemistry Control – Closed Cooling Water and Water Chemistry Control – Auxiliary Systems Programs manage loss of material for stainless steel heat exchanger components. The only components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-14-xx tables.
3.3.1-50	Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	The Water Chemistry Control – Closed Cooling Water and Water Chemistry Control – Auxiliary Systems Programs manage loss of material for stainless steel components.
3.3.1-51	Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	The Water Chemistry Control – Closed Cooling Water, Water Chemistry Control – Auxiliary Systems and Fire Protection Programs manage loss of material for copper alloy components.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-52	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	The Water Chemistry Control – Closed Cooling Water, Water Chemistry Control – Auxiliary Systems and Fire Protection Programs manage reduction of heat transfer for copper alloy heat exchanger tubes exposed to closed cycle cooling water. The auxiliary systems have no steel or stainless steel heat exchanger tubes exposed to closed cycle cooling water with a heat transfer intended function.
3.3.1-53	Steel compressed air system piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to general and pitting corrosion	Compressed Air Monitoring	No	Not applicable. The JAFNPP instrument air system components with an intended function for license renewal are exposed to dried, filtered air and are not subject to internal condensation.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-54	Stainless steel compressed air system piping, piping components, and piping elements exposed to internal condensation	Loss of material due to pitting and crevice corrosion	Compressed Air Monitoring	No	Not applicable. The JAFNPP instrument air system components with an intended function for license renewal are exposed to dried, filtered air and not exposed to internal condensation.
3.3.1-55	Steel ducting closure bolting exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The External Surfaces Monitoring Program manages loss of material for steel closure bolting in the HVAC systems.
3.3.1-56	Steel HVAC ducting and components external surfaces exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The External Surfaces Monitoring Program manages loss of material for external surfaces of steel components.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-57	Steel piping and components external surfaces exposed to air – indoor uncontrolled (External)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The External Surfaces Monitoring Program manages loss of material for external surfaces of steel components.
3.3.1-58	Steel external surfaces exposed to air – indoor uncontrolled (external), air - outdoor (external), and condensation (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801 for most steel components. The External Surfaces Monitoring Program manages loss of material for external surfaces. The Fire Protection Program manages loss of material for external surfaces of some fire protection components.
3.3.1-59	Steel heat exchanger components exposed to air – indoor uncontrolled (external) or air - outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The External Surfaces Monitoring Program manages loss of material for external surfaces of steel heat exchanger components.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-60	Steel piping, piping components, and piping elements exposed to air - outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The External Surfaces Monitoring Program manages loss of material for external surfaces of steel components.
3.3.1-61	Elastomer fire barrier penetration seals exposed to air – outdoor or air - indoor uncontrolled	Increased hardness, shrinkage and loss of strength due to weathering	Fire Protection	No	This line item was not used in the auxiliary systems tables. Fire barrier seals are evaluated as structural components in Section 3.5. Cracking and the change in material properties of elastomer seals are managed by the Fire Protection Program.
3.3.1-62	Aluminum piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion	Fire Protection	No	The One-Time Inspection Program manages loss of material for aluminum components exposed to raw water. The only components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-14-xx tables.
3.3.1-63	Steel fire rated doors exposed to air – outdoor or air - indoor uncontrolled	Loss of material due to Wear	Fire Protection	No	This line item was not used in the auxiliary systems tables. Steel fire doors are evaluated as structural components in Section 3.5. The loss of material for fire doors is managed by the Fire Protection Program.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-64	Steel piping, piping components, and piping elements exposed to fuel oil	Loss of material due to general, pitting, and crevice corrosion	Fire Protection and Fuel Oil Chemistry	No	Consistent with NUREG-1801. The Fire Protection and Diesel Fuel Monitoring Programs manage loss of material of steel diesel fire pump fuel supply piping.
3.3.1-65	Reinforced concrete structural fire barriers – walls, ceilings and floors exposed to air – indoor uncontrolled	Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	No	This line item was not used. Reinforced concrete structural fire barriers are evaluated as structural components in Section 3.5.
3.3.1-66	Reinforced concrete structural fire barriers – walls, ceilings and floors exposed to air – outdoor	Concrete cracking and spalling due to freeze thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	No	This line item was not used. Reinforced concrete structural fire barriers are evaluated as structural components in Section 3.5.
3.3.1-67	Reinforced concrete structural fire barriers – walls, ceilings and floors exposed to air – outdoor or air - indoor uncontrolled	Loss of material due to corrosion of embedded steel	Fire Protection and Structures Monitoring Program	No	This line item was not used. Reinforced concrete structural fire barriers are evaluated as structural components in Section 3.5.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

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 raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801 for most fire protection system components. The loss of material in steel components exposed to raw or untreated water is managed by the Fire Water System Program. The Fire Protection Program manages loss of material for steel components of the fire diesel cooling water system.
3.3.1-69	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801. The loss of material in stainless steel components exposed to raw or untreated water is managed by the Fire Water System Program.
3.3.1-70	Copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801 for most fire protection system components. The loss of material in copper alloy components exposed to raw water is managed by the Fire Water System Program. The Fire Protection Program manages loss of material for copper alloy components of the fire diesel cooling water system.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-71	Steel piping, piping components, and piping elements exposed to moist air or condensation (Internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	The Periodic Surveillance and Preventive Maintenance and One-Time Inspection Programs manage loss of material or confirm it is insignificant for steel components exposed to moist air or condensation using visual inspections or other NDE techniques.
3.3.1-72	Steel HVAC ducting and components internal surfaces exposed to condensation (Internal)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable. There are no internal steel component surfaces exposed to condensation in the HVAC systems with intended functions for license renewal.
3.3.1-73	Steel crane structural girders in load handling system exposed to air- indoor uncontrolled (external)	Loss of material due to general corrosion	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	This line item was not used in the auxiliary systems tables. Steel crane structural girders are evaluated as structural components in Section 3.5. Loss of material for steel crane structural components is managed by the Periodic Surveillance and Preventive Maintenance and Structures Monitoring Programs.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-74	Steel cranes - rails exposed to air – indôor uncontrolled (external)	Loss of material due to Wear	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	This line item was not used. Steel crane rails are evaluated as structural components in Section 3.5.
3.3.1-75	Elastomer seals and components exposed to raw water	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion	Open-Cycle Cooling Water System	No	Not applicable. There are no elastomeric components exposed to raw or untreated water in the auxiliary systems that require aging management.
3.3.1-76	Steel piping, piping components, and piping elements (without lining/ coating or with degraded lining/ coating) exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining/coating degradation	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801 for most components exposed to raw water from the service water system. The Service Water Integrity Program manages loss of material in steel components. For other components exposed to raw or untreated water, the Periodic Surveillance and Preventive Maintenance Program manages loss of material.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-77	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	The Service Water Integrity and Periodic Surveillance and Preventive Maintenance Programs manage loss of material for steel heat exchanger components.
3.3.1-78	Stainless steel, nickel alloy, and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801 for most components exposed to raw water from the service water system. The Service Water Integrity Program manages loss of material in nickel alloy components. Stainless steel and copper alloy components exposed to raw water are addressed in other items including 3.3.1-79 and 3.3.1-81.
3.3.1-79	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801 for most components exposed to raw water from the service water system. The Service Water Integrity Program manages loss of material in stainless steel components. For other components exposed to raw water, the Periodic Surveillance and Preventive Maintenance and One-Time Inspection Programs manage loss of material or confirm it is insignificant.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-80	Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Open-Cycle Cooling Water System	No	This line applies to EDG system components and was not used. There are no stainless steel components exposed to raw water in the EDG system. Copper alloy heat exchanger components exposed to raw water are addressed in line 3.3.1-82.
3.3.1-81	Copper alloy piping, piping components, and piping elements, exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801 for most components exposed to raw water from the service water system. The Service Water Integrity Program manages loss of material in copper alloy components. For other components exposed to raw water, the Periodic Surveillance and Preventive Maintenance and One-Time Inspection Programs manage loss of material or confirm it is insignificant.
3.3.1-82	Copper alloy heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Service Water Integrity Program manages loss of material in copper alloy heat exchanger components.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-83	Stainless steel and copper alloy heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	The Service Water Integrity, Periodic Surveillance and Preventive Maintenance and Fire Protection Programs manage reduction of heat transfer in copper alloy heat exchanger tubes. There are no stainless steel heat exchanger tubes exposed to raw water in the auxiliary systems.
3.3.1-84	Copper alloy >15% Zn piping, piping components, piping elements, and heat exchanger components exposed to raw water, treated water, or closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. The Selective Leaching Program will manage loss of material in copper alloy > 15% zinc components exposed to all types of water.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-85	Gray cast iron piping, piping components, and piping elements exposed to soil, raw water, treated water, or closed-cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. The Selective Leaching Program will manage loss of material in gray cast iron components exposed to soil and all types of water.
3.3.1-86	Structural steel (new fuel storage rack assembly) exposed to air – indoor uncontrolled (external)	Loss of material due to general, pitting, and crevice corrosion	Structures Monitoring Program	No	This line item was not used. Structural steel of the new fuel storage rack assembly is evaluated as a structural component in Section 3.5.
3.3.1-87	PWR only				
3.3.1-88	PWR only				
3.3.1-89	PWR only				
3.3.1-90	PWR only				
3.3.1-91	PWR only				

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-92	Galvanized steel piping, piping components, and piping elements exposed to air – indoor uncontrolled	None	None	NA - No AEM or AMP	Not applicable. Galvanized steel surfaces are evaluated as steel for the auxiliary systems.
3.3.1-93	Glass piping elements exposed to air, air – indoor uncontrolled (external), fuel oil, lubricating oil, raw water, treated water, and treated borated water	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3.1-94	Stainless steel and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-95	Steel and aluminum piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. There are no steel or aluminum components exposed to indoor air controlled in the auxiliary systems. All indoor air environments are conservatively considered to be uncontrolled.
3.3.1-96	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3.1-97	Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-98	Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3.1-99	PWR only				

Notes for Tables 3.3.2-1 through 3.3.2-14-44

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 air - untreated environment is normally considered equivalent to the NUREG-1801 defined environment of condensation; however, this stainless steel component is sufficiently far downstream of the air compressor that no significant condensation will occur. Consequently, no aging effects are anticipated, which is consistent with stainless steel in an indoor air environment.

302. This treated water environment is engine jacket cooling water.

303. The air - treated environment is the equivalent of dried air and for the purposes of evaluating aluminum components, the air - treated environment is drier than the NUREG-1801 defined air - indoor uncontrolled.

304. This treated water environment is main generator stator cooling water and is controlled by the Water Chemistry Control – Auxiliary Systems Program. Although this environment does not directly compare with any NUREG-1801 defined environment, it approximates the NUREG-1801 defined closed cycle cooling water environment.
305. This component is part of the diesel cooling water system.
306. This component is normally exposed to outdoor air, but may also be subject to pooling of rainwater. Consequently, the air - outdoor environment is evaluated as raw water for this component.
307. This component is part of the chilled water subsystem of the control room HVAC system. This treated water environment is controlled by the Water Chemistry Control – Auxiliary Systems Program. Although this environment does not directly compare with any NUREG-1801 defined environment, it approximates the NUREG-1801 defined closed cycle cooling water environment.
308. The vacuum environment is between the inner and outer walls of the liquid nitrogen storage tank.
309. 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 air intake that is not exposed to elevated temperatures.
310. The untreated air environment is the equivalent of the NUREG-1801 defined condensation.
311. Portions of the system piping are subject to erosion. This piping is included in augmented inspections for flow accelerated corrosion as part of the periodic surveillance and preventive maintenance program.
312. This treated water environment is plant heating system water and is controlled by the Water Chemistry Control – Auxiliary Systems Program. Although this environment does not directly compare with any NUREG-1801 defined environment, it approximates the NUREG-1801 defined closed cycle cooling water environment.
313. This treated water environment is auxiliary boiler system water and is controlled by the Water Chemistry Control – Auxiliary Systems Program. Although this environment does not directly compare with any NUREG-1801 defined environment, it approximates the NUREG-1801 defined closed cycle cooling water environment.
314. This treated water environment is decay heat removal system secondary cooling loop water and is controlled by the Water Chemistry Control – Auxiliary Systems Program. Although this environment does not directly compare with any NUREG-1801 defined environment, it approximates the NUREG-1801 defined closed cycle cooling water environment.

315. The One-Time Inspection Program will verify the effectiveness of the Water Chemistry Control – BWR Program.

Table 3.3.2-1
Standby Liquid Control System
Summary of Aging Management Evaluation

Table 3.3.2-1: Standby Liquid Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Accumulator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Accumulator	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-1: Standby Liquid Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tank	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Tank	Pressure boundary	Stainless steel	Concrete (ext)	None	None	VII.J-17 (AP-19)	3.3.1-96	A
Tank	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Thermowell	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315

Table 3.3.2-1: Standby Liquid Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315

Table 3.3.2-2
Service Water Systems
Summary of Aging Management Evaluation

Table 3.3.2-2: Service Water Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.D-1 (A-103)	3.3.1-44	C
Bolting	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.F1-1 (A-09)	3.3.1-27	E
Flow element	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Flow element	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Flow element	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Flow element	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Orifice	Pressure boundary, Flow control	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E

Table 3.3.2-2: Service Water Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Orifice	Pressure boundary, Flow control	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	D
Pump casing	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Pump casing	Pressure boundary	Gray cast iron	Raw water (ext)	Loss of material	Selective Leaching	VII.C1-11 (A-51)	3.3.1-85	A
Pump casing	Pressure boundary	Gray cast iron	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Pump casing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.C1-11 (A-51)	3.3.1-85	A

Table 3.3.2-2: Service Water Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Strainer	Filtration	Stainless steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Strainer	Filtration	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Strainer housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Thermowell	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Thermowell	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Thermowell	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E

Table 3.3.2-2: Service Water Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	D
Valve body	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-16 (A-46)	3.3.1-25	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	B
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E

Table 3.3.2-2: Service Water Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B

Table 3.3.2-3
Emergency Diesel Generator System
Summary of Aging Management Evaluation

Table 3.3.2-3: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-7 (A-105)	3.3.1-55	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I-1 (AP-28)	3.3.1-43	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Duct	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Duct	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A

Table 3.3.2-3: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	Periodic Surveillance and Preventive Maintenance	VII.F1-7 (A-17)	3.3.1-11	E
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.F1-7 (A-17)	3.3.1-11	E
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	None	None	VII.F1-7 (A-17)	3.3.1-11	I, 309
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking – fatigue	TLAA – metal fatigue			H
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E

Table 3.3.2-3: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Filter housing	Pressure boundary	Stainless steel	Air – untreated (int)	None	None			G, 301
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.H2-3 (AP-41)	3.3.1-59	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-5 (A-64)	3.3.1-77	D
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	D
Heat exchanger (fins)	Heat transfer	Aluminum	Air – indoor (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.H2-3 (AP-41)	3.3.1-59	A

Table 3.3.2-3: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.H2-3 (AP-41)	3.3.1-59	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-5 (AP-39)	3.3.1-21	E
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	D
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Raw water (int)	Fouling	Service Water Integrity	VII.C1-6 (A-72)	3.3.1-83	D
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Treated water (ext)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.C2-2 (AP-80)	3.3.1-52	D
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Air – indoor (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			G

Table 3.3.2-3: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Lube oil (ext)	Fouling	Oil Analysis	V.D2-9 (EP-47	3.2.1-9	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water (int)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.C2-2 (AP-80)	3.3.1-52	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-3 (A-65)	3.3.1-82	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-8 (AP-34)	3.3.1-51	D
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% Zn	Air – indoor (ext)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

Table 3.3.2-3: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material – wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	A, 302
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-8 (AP-34)	3.3.1-51	D
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.H2-3 (AP-41)	3.3.1-59	A
Heater housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	D
Lubricator housing	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Lubricator housing	Pressure boundary	Aluminum	Air – untreated (int)	None	None			G

Table 3.3.2-3: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Motor housing	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Motor housing	Pressure boundary	Aluminum	Air – untreated (int)	None	None			G
Motor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Motor housing	Pressure boundary	Carbon steel	Air – untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E,310
Muffler	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A
Muffler	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking – fatigue	TLAA – metal fatigue			H
Muffler	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Orifice	Pressure boundary, Flow control	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

Table 3.3.2-3: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Orifice	Pressure boundary, Flow control	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E, 310
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	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B

Table 3.3.2-3: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	VII.J-10 (AP-15)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J-13 (AP-51)	3.3.1-93	A
Strainer	Filtration	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E

Table 3.3.2-3: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer	Filtration	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Strainer	Filtration	Copper alloy > 15% Zn	Air – untreated (ext)	None	None			G
Strainer	Filtration	Copper alloy > 15% Zn	Air – untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-9 (AP-78)	3.3.1-28	E, 310
Strainer	Filtration	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Strainer	Filtration	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Strainer	Filtration	Stainless steel	Lube oil (ext)	Cracking	Oil Analysis			H
Strainer	Filtration	Stainless steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2-17 (AP-59)	3.3.1-33	E
Strainer	Filtration	Stainless steel	Lube oil (int)	Cracking	Oil Analysis			H
Strainer	Filtration	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-17 (AP-59)	3.3.1-33	E
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-3: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer housing	Pressure boundary	Carbon steel	Air – untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E, 310
Strainer housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Strainer housing	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Strainer housing	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Air – untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E, 310
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-3: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Thermowell	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tubing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Air – untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-9 (AP-78)	3.3.1-28	E, 310
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-8 (AP-12)	3.3.1-51	B
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-17 (AP-59)	3.3.1-33	E

Table 3.3.2-3: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Valve body	Pressure boundary	Aluminum	Lube oil (int)	Loss of material	Oil Analysis			G
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air – untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E, 310
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Valve body	Pressure boundary	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-9 (AP-78)	3.3.1-28	E, 310
Valve body	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E

Table 3.3.2-3: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	A, 302
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-8 (AP-12)	3.3.1-51	B
Valve body	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Air – untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E, 310
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.C2-8 (A-50)	3.3.1-85	C, 302
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Air – untreated (int)	None	None			G, 301
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-17 (AP-59)	3.3.1-33	E

Table 3.3.2-4
Fuel Oil System
Summary of Aging Management Evaluation

Table 3.3.2-4: Fuel Oil System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I-1 (AP-28)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Bolting Integrity			G
Flame arrestor	Pressure boundary	Aluminum	Air – outdoor (ext)	None	None			G
Flame arrestor	Pressure boundary	Aluminum	Air – outdoor (int)	None	None			G
Flame arrestor	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.H1-8 (A-24)	3.3.1-60	A
Flow meter housing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

Table 3.3.2-4: Fuel Oil System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flow meter housing	Pressure boundary	Copper alloy	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-3 (AP-44)	3.3.1-32	E
Injector housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Injector housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.H1-8 (A-24)	3.3.1-60	A
Piping	Pressure boundary	Carbon steel	Concrete (ext)	None	None	VII.J-21 (AP-3)	3.3.1-96	A
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Fire Protection Diesel Fuel Monitoring	VII.G-21 (A-28)	3.3.1-64	A
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.H1-9 (A-01)	3.3.1-19	B

Table 3.3.2-4: Fuel Oil System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Gray cast iron	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Strainer	Filtration	Copper alloy > 15% Zn	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1-3 (AP-44)	3.3.1-32	E
Strainer	Filtration	Copper alloy > 15% Zn	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-3 (AP-44)	3.3.1-32	E
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Tank	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.H1-9 (A-01)	3.3.1-19	B
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-4: Fuel Oil System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-6 (AP-54)	3.3.1-32	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-6 (AP-54)	3.3.1-32	E

Table 3.3.2-5
Fire Protection-Water System
Summary of Aging Management Evaluation

Table 3.3.2-5: Fire Protection—Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I-1 (AP-28)	3.3.1-43	A
Bolting	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.G-25 (A-01)	3.3.1-19	D
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	None	None			G
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking – fatigue	Fire Protection			H
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Loss of material	Fire Protection	VII.H2-2 (A-27)	3.3.1-18	E

Table 3.3.2-5: Fire Protection—Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**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-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Fire Protection	V.B-1 (E-25)	3.2.1-32	E
Gear box housing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Gear box housing	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Heat exchanger (bonnet)	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Heat exchanger (bonnet)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Fire Protection	VII.C2-4 (AP-12)	3.3.1-51	E, 302
Heat exchanger (bonnet)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.C2-6 (AP-43)	3.3.1-84	C, 302
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.G-5 (AP-41)	3.3.1-59	A

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Heat exchanger (shell)	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Heat exchanger (shell)	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Fire Protection	VII.G-12 (A-45)	3.3.1-70	E, 305
Heat exchanger (shell)	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-4 (A-66)	3.3.1-84	C
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.G-5 (AP-41)	3.3.1-59	A
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Protection	VII.C2-1 (A-63)	3.3.1-48	E, 302
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.C2-8 (A-50)	3.3.1-85	C, 302
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Lube oil (int)	Fouling	Oil Analysis	V.D2-9 (EP-47	3.2.1-9	E

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Raw water (ext)	Fouling	Fire Protection	VII.C1-6 (A-72)	3.3.1-83	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water (ext)	Fouling	Fire Protection	VII.C2-2 (AP-80)	3.3.1-52	E, 302
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water (int)	Fouling	Fire Protection	VII.C2-2 (AP-80)	3.3.1-52	E,302
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.G-11 (AP-47)	3.3.1-26	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Raw water (ext)	Loss of material	Fire Protection	VII.G-12 (A-45)	3.3.1-70	E, 305
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Raw water (ext)	Loss of material	Selective Leaching	VII.C1-4 (A-66)	3.3.1-84	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Raw water (ext)	Loss of material – wear	Fire Protection			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (ext)	Loss of material	Fire Protection	VII.C2-4 (AP-12)	3.3.1-51	E, 302

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (ext)	Loss of material	Selective Leaching	VII.C2-6 (AP-43)	3.3.1-84	C, 302
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Fire Protection	VII.C2-4 (AP-12)	3.3.1-51	E, 302
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.C2-6 (AP-43)	3.3.1-84	C, 302
Heater housing	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Heater housing	Pressure boundary	Aluminum	Treated water (int)	Loss of material	Fire Protection			G, 302
Muffler	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Muffler	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking – fatigue	Fire Protection			H
Muffler	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Fire Protection	VII.H2-2 (A-27)	3.3.1-18	E

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzle	Pressure boundary, Flow control	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Nozzle	Pressure boundary, Flow control	Carbon steel	Air – indoor (int)	Loss of material	Fire Water System	V.A-19 (E-29)	3.2.1-32	E
Nozzle	Pressure boundary, Flow control	Carbon steel	Fire protection foam (int)	Loss of material	Fire Water System			G
Nozzle	Pressure boundary, Flow control	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Nozzle	Pressure boundary, Flow control	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Nozzle	Pressure boundary, Flow control	Copper alloy > 15% Zn	Air – indoor (int)	None	None			G

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzle	Pressure boundary, Flow control	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Fire Water System	VII.G-12 (A-45)	3.3.1-70	B
Nozzle	Pressure boundary, Flow control	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.G-13 (A-47)	3.3.1-84	A
Orifice	Pressure boundary, Flow control	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary, Flow control	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Piping	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Piping	Pressure boundary	Aluminum	Air – indoor (int)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Fire Protection	V.A-19 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Fire Water System	V.A-19 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking – fatigue	Fire Protection			H
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Fire Protection	VII.H2-2 (A-27)	3.3.1-18	E
Piping	Pressure boundary	Carbon steel	Fire protection foam (int)	Loss of material	Fire Water System			G
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Protection	VII.G-24 (A-33)	3.3.1-68	E, 305
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Fire Protection	VII.C2-14 (A-25)	3.3.1-47	E, 302

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A, 306
Piping	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Piping	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A
Piping	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.G-25 (A-01)	3.3.1-19	B
Piping	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Selective Leaching	VII.G-15 (A-02)	3.3.1-85	A
Pump casing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Gray cast iron	Lube oil (ext)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A
Pump casing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Protection	VII.C2-14 (A-25)	3.3.1-47	E, 302
Pump casing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.C2-8 (A-50)	3.3.1-85	C, 302
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Sight glass	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Raw water (int)	None	None	VII.J-11 (AP-50)	3.3.1-93	A
Strainer	Filtration	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.G-11 (AP-47)	3.3.1-26	E

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer	Filtration	Stainless steel	Fire protection foam (int)	Loss of material	Fire Water System			G
Strainer	Filtration	Stainless steel	Raw water (ext)	Loss of material	Fire Water System	VII.G-19 (A-55)	3.3.1-69	B
Strainer	Filtration	Stainless steel	Raw water (int)	Loss of material	Fire Water System	VII.G-19 (A-55)	3.3.1-69	B
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Fire protection foam (int)	Loss of material	Fire Water System			G
Strainer housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Strainer housing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Strainer housing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Fire protection foam (int)	Loss of material	Fire Water System			G
Tank	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tank	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Fire Protection	VII.C2-4 (AP-12)	3.3.1-51	E, 302
Tank	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.C2-6 (AP-43)	3.3.1-84	D, 302
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tubing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Tubing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Fire Water System	VII.G-12 (A-45)	3.3.1-70	B

Table 3.3.2-5: Fire Protection—Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Fire Water System	VII.G-19 (A-55)	3.3.1-69	B
Turbocharger housing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Turbocharger housing	Pressure boundary	Gray cast iron	Air – indoor (int)	Loss of material	Fire Protection	V.B-1 (E-25)	3.2.1-32	E
Turbocharger housing	Pressure boundary	Gray cast iron	Exhaust gas (int)	Cracking – fatigue	Fire Protection			H
Turbocharger housing	Pressure boundary	Gray cast iron	Exhaust gas (int)	Loss of material	Fire Protection	VII.H2-2 (A-27)	3.3.1-18	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Fire Protection	V.A-19 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking – fatigue	Fire Protection			H
Valve body	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Fire Protection	VII.H2-2 (A-27)	3.3.1-18	E

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Fire protection foam (int)	Loss of material	Fire Water System			G
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Fire Protection	VII.C2-14 (A-25)	3.3.1-47	E, 302
Valve body	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy	Fire protection foam (int)	Loss of material	Fire Water System			G
Valve body	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Fire Water System	VII.G-12 (A-45)	3.3.1-70	B
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Fire protection foam (int)	Loss of material	Fire Water System			G
Valve body	Pressure boundary	Copper alloy > 15% Zn	Fire protection foam (int)	Loss of material	Selective Leaching			G
Valve body	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.G-11 (AP-47)	3.3.1-26	E

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Fire Water System	VII.G-12 (A-45)	3.3.1-70	B
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.G-13 (A-47)	3.3.1-84	A
Valve body	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A, 306
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A
Valve body	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.G-25 (A-01)	3.3.1-19	B
Valve body	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Selective Leaching	VII.G-15 (A-02)	3.3.1-85	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-5: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Fire Water System	VII.G-19 (A-55)	3.3.1-69	B

Table 3.3.2-6
Fire Protection-CO_2 System
Summary of Aging Management Evaluation

Table 3.3.2-6: Fire Protection—CO_2 System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Coil	Pressure boundary	Copper alloy > 15% Zn	Gas (ext)	None	None	VII.J-4 (AP-9)	3.3.1-97	C
Coil	Pressure boundary	Copper alloy > 15% Zn	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	C
Nozzle	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Fire Protection	VII.I-8 (A-77)	3.3.1-58	E
Nozzle	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Fire Protection	V.A-19 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Fire Protection	VII.I-8 (A-77)	3.3.1-58	E
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Fire Protection	V.A-19 (E-29)	3.2.1-32	E

Table 3.3.2-6: Fire Protection—CO_2 System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Fire Protection	VII.I-8 (A-77)	3.3.1-58	E
Tank	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Air – indoor (int)	None	None			G
Tubing	Pressure boundary	Copper alloy	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Fire Protection	VII.I-8 (A-77)	3.3.1-58	E

Table 3.3.2-6: Fire Protection—CO_2 System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Fire Protection	V.A-19 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Gas (ext)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Valve body	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (int)	None	None			G
Valve body	Pressure boundary	Copper alloy > 15% Zn	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A

Table 3.3.2-7
Heating, Ventilation and Air Conditioning Systems
Summary of Aging Management Evaluation

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-4 (A-105)	3.3.1-55	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Compressor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-2 (A-10)	3.3.1-56	A
Compressor housing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Damper housing	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Damper housing	Pressure boundary	Aluminum	Air – indoor (int)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-2 (A-10)	3.3.1-56	A

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-2 (A-10)	3.3.1-56	A
Duct	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	Periodic Surveillance and Preventive Maintenance	VII.F1-7 (A-17)	3.3.1-11	E
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.F1-7 (A-17)	3.3.1-11	E
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Change in material properties	Periodic Surveillance and Preventive Maintenance	VII.F1-7 (A-17)	3.3.1-11	E
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.F1-7 (A-17)	3.3.1-11	E

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-2 (A-10)	3.3.1-56	A
Fan housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Fan housing	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-2 (A-10)	3.3.1-56	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Filter housing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-2 (A-10)	3.3.1-56	A
Flow element	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Flow element	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flow element	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Flow element	Pressure boundary, Flow control	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Flow element	Pressure boundary, Flow control	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-20 (A-25)	3.3.1-47	E, 307
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.C1-11 (A-51)	3.3.1-85	C
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-5 (A-64)	3.3.1-77	D
Heat exchanger (fins)	Heat transfer	Aluminum	Condensation (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			H

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (fins)	Heat transfer	Aluminum	Condensation (ext)	Fouling	Service Water Integrity			H
Heat exchanger (fins)	Heat transfer	Aluminum	Condensation (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1-14 (AP-74)	3.3.1-27	E
Heat exchanger (fins)	Heat transfer	Aluminum	Condensation (ext)	Loss of material	Service Water Integrity	VII.F1-14 (AP-74)	3.3.1-27	E
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-10 (AP-41)	3.3.1-59	A
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A
Heat exchanger (housing)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (housing)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Heat exchanger (housing)	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Heat exchanger (housing)	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring			G
Heat exchanger (housing)	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1-1 (A-09)	3.3.1-27	E
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-10 (AP-41)	3.3.1-59	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-11 (A-63)	3.3.1-48	E, 307
Heat exchanger (tubes)	Heat transfer	Copper alloy	Raw water (int)	Fouling	Periodic Surveillance and Preventive Maintenance	VII.C1-6 (A-72)	3.3.1-83	E
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (ext)	Fouling	Water Chemistry Control – Auxiliary Systems	VII.F1-12 (AP-80)	3.3.1-52	E, 307
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Condensation (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			G
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Condensation (ext)	Fouling	Service Water Integrity			G
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Raw water (int)	Fouling	Service Water Integrity	VII.C1-6 (A-72)	3.3.1-83	D
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water (int)	Fouling	Water Chemistry Control – Auxiliary Systems	VII.F1-12 (AP-80)	3.3.1-52	E, 307

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Gas (ext)	Loss of material – wear	Service Water Integrity			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-3 (A-65)	3.3.1-82	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (ext)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-8 (AP-34)	3.3.1-51	E, 307
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (ext)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1-16 (A-46)	3.3.1-25	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	Service Water Integrity	VII.F1-16 (A-46)	3.3.1-25	E

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material – wear	Service Water Integrity			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-4 (A-66)	3.3.1-84	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-3 (A-65)	3.3.1-82	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.F1-17 (AP-43)	3.3.1-84	A, 307
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-8 (AP-34)	3.3.1-51	E, 307
Heat exchanger (tubesheets)	Pressure boundary	Nickel alloy	Gas (int)	None	None			G

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubesheets)	Pressure boundary	Nickel alloy	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-13 (AP-53)	3.3.1-78	D
Louver housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-2 (A-10)	3.3.1-56	A
Louver housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Louver housing	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-2 (A-10)	3.3.1-56	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-20 (A-25)	3.3.1-47	E, 307
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Pump casing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-20 (A-25)	3.3.1-47	E, 307
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J-13 (AP-51)	3.3.1-93	A
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-10 (A-52)	3.3.1-50	E, 307
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-10 (A-52)	3.3.1-50	E, 307
Strainer housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-20 (A-25)	3.3.1-47	E, 307
Tank	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-20 (A-25)	3.3.1-47	E, 307
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Air – indoor (int)	None	None			G

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-16 (A-46)	3.3.1-25	E
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	D
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-15 (AP-12)	3.3.1-51	E, 307
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	D
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-10 (A-52)	3.3.1-50	E, 307
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-2 (A-10)	3.3.1-56	A

Table 3.3.2-7: Heating, Ventilation and Air Conditioning Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-20 (A-25)	3.3.1-47	E, 307
Valve body	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy	Air – indoor (int)	None	None			G
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-10 (A-52)	3.3.1-50	E, 307

Table 3.3.2-8
Containment Purge, Containment Atmosphere Dilution and Post-Accident Sampling Systems
Summary of Aging Management Evaluation

Table 3.3.2-8: Containment Purge, Containment Atmosphere Dilution and Post-Accident Sampling Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.F1-1 (A-09)	3.3.1-27	E
Filter housing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Filter housing	Pressure boundary	Stainless steel	Liquid nitrogen (int)	None	None			G
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Flow element	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Heat exchanger (coil)	Heat transfer	Aluminum	Condensation (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (coil)	Heat transfer	Aluminum	Liquid nitrogen (int)	None	None			G

Table 3.3.2-8: Containment Purge, Containment Atmosphere Dilution and Post-Accident Sampling Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (coil)	Heat transfer	Stainless steel	Condensation (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			G
Heat exchanger (coil)	Heat transfer	Stainless steel	Liquid nitrogen (int)	None	None			G
Heat exchanger (coil)	Pressure boundary	Aluminum	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-14 (AP-74)	3.3.1-27	E
Heat exchanger (coil)	Pressure boundary	Aluminum	Liquid nitrogen (int)	None	None			G
Heat exchanger (coil)	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Heat exchanger (coil)	Pressure boundary	Stainless steel	Liquid nitrogen (int)	None	None			G
Heater housing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Heater housing	Pressure boundary	Stainless steel	Liquid nitrogen (int)	None	None			G
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G

Table 3.3.2-8: Containment Purge, Containment Atmosphere Dilution and Post-Accident Sampling Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Piping	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Piping	Pressure boundary	Stainless steel	Liquid nitrogen (int)	None	None			G
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Sample trap	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Sample trap	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G

Table 3.3.2-8: Containment Purge, Containment Atmosphere Dilution and Post-Accident Sampling Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Vacuum (int)	None	None			G, 308
Tank	Pressure boundary	Stainless steel	Liquid nitrogen (int)	None	None			G
Tank	Pressure boundary	Stainless steel	Vacuum (ext)	None	None			G, 308
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-27)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Tubing	Pressure boundary	Stainless steel	Liquid nitrogen (int)	None	None			G
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-8: Containment Purge, Containment Atmosphere Dilution and Post-Accident Sampling Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Valve body	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Valve body	Pressure boundary	Stainless steel	Liquid nitrogen (int)	None	None			G

Table 3.3.2-9
Fuel Pool Cooling and Cleanup System
Summary of Aging Management Evaluation

Table 3.3.2-9: Fuel Pool Cooling and Cleanup System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Diffuser	Flow control	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A, 315
Diffuser	Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A, 315
Neutron absorber	Neutron absorption	Aluminum/boron carbide	Treated water (ext)	Cracking	Water Chemistry Control – BWR			H
Neutron absorber	Neutron absorption	Aluminum/boron carbide	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VII.A2-3 (A-89)	3.3.1-13	E
Orifice	Pressure boundary, Flow control	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-9: Fuel Pool Cooling and Cleanup System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A, 315
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A, 315
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A, 315

Table 3.3.2-10
Service, Instrument and Breathing Air Systems
Summary of Aging Management Evaluation

Table 3.3.2-10: Service, Instrument and Breathing Air Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Piping	Pressure boundary	Copper alloy	Air – treated (int)	None	None	VII.J-3 (AP-8)	3.3.1-98	A, 303
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Quick connect	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Quick connect	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A

Table 3.3.2-10: Service, Instrument and Breathing Air Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.D-3 (A-80)	3.3.1-57	A
Tank	Pressure boundary	Carbon steel	Air – treated (int)	None	None	VII.J-22 (AP-4)	3.3.1-98	A, 303
Tank	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Valve body	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Valve body	Pressure boundary	Aluminum	Air – treated (int)	None	None	V.F-2 (EP-3)	3.2.1-50	C, 303
Valve body	Pressure boundary	Aluminum	Gas (int)	None	None	VII.J-2 (AP-37)	3.3.1-97	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – treated (int)	None	None	VII.J-3 (AP-8)	3.3.1-98	A, 303

Table 3.3.2-10: Service, Instrument and Breathing Air Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy > 15% Zn	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Air – treated (int)	None	None	VII.J-18 (AP-20)	3.3.1-98	A, 303
Valve body	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A

Table 3.3.2-11
Reactor Building Closed Loop Cooling Water System
Summary of Aging Management Evaluation

Table 3.3.2-11: Reactor Building Closed Loop Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Accumulator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Accumulator	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Flow control	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Orifice	Flow control	Copper alloy > 15% Zn	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-11: Reactor Building Closed Loop Cooling Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Valve body	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Valve body	Pressure boundary	Aluminum	Gas (int)	None	None	VII.J-2 (AP-37)	3.3.1-97	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B

Table 3.3.2-11: Reactor Building Closed Loop Cooling Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A

Table 3.3.2-12
Radwaste and Plant Drains
Summary of Aging Management Evaluation

Table 3.3.2-12: Radwaste and Plant Drains

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Bolting	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.C1-18 (A-01)	3.3.1-19	D
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Filter housing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-12: Radwaste and Plant Drains

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Flow element	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	One-Time Inspection	V.A-19 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Concrete (ext)	None	None	VII.J-21 (AP-3)	3.3.1-96	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.C1-18 (A-01)	3.3.1-19	D
Piping	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Piping	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-9 (A-44)	3.3.1-81	E

Table 3.3.2-12: Radwaste and Plant Drains

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.G-13 (A-47)	3.3.1-84	C
Piping	Pressure boundary	Fiberglass	Air – indoor (ext)	None	None			F
Piping	Pressure boundary	Fiberglass	Air – indoor (int)	None	None			F
Piping	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Gray cast iron	Air – indoor (int)	Loss of material	One-Time Inspection	V.A-19 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Gray cast iron	Concrete (ext)	None	None	VII.J-21 (AP-3)	3.3.1-96	A
Piping	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Piping	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.C1-18 (A-01)	3.3.1-19	D
Piping	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Selective Leaching	VII.C1-12 (A-02)	3.3.1-85	C

Table 3.3.2-12: Radwaste and Plant Drains

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
Pump casing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Gray cast iron	Raw water (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Pump casing	Pressure boundary	Gray cast iron	Raw water (ext)	Loss of material	Selective Leaching	VII.C1-11 (A-51)	3.3.1-85	C
Pump casing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Pump casing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.C1-11 (A-51)	3.3.1-85	C
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Concrete (ext)	None	None	VII.J-21 (AP-3)	3.3.1-96	A

Table 3.3.2-12: Radwaste and Plant Drains

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Tank	Pressure boundary	Fiberglass	Raw water (int)	None	None			F
Tank	Pressure boundary	Fiberglass	Soil (ext)	None	None			F
Tank	Pressure boundary	Stainless steel	Concrete (ext)	None	None	VII.J-17 (AP-19)	3.3.1-96	A
Tank	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-15 (A-54)	3.3.1-79	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E

Table 3.3.2-13
Security Generator
Summary of Aging Management Evaluation

Table 3.3.2-13: Security Generator								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I-1 (AP-28)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking – fatigue	Periodic Surveillance and Preventive Maintenance			H
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-13: Security Generator								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.H2-3 (AP-41)	3.3.1-59	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-5 (AP-39)	3.3.1-21	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Air – indoor (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			G
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Lube oil (ext)	Fouling	Oil Analysis	V.D2-9 (EP-47)	3.2.1-9	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water (int)	Fouling	Water Chemistry Control – Auxiliary Systems	VII.C2-2 (AP-80)	3.3.1-52	E, 302
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance			H

Table 3.3.2-13: Security Generator								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.C2-6 (AP-43)	3.3.1-84	C, 302
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-4 (AP-12)	3.3.1-51	E, 302
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking – fatigue	Periodic Surveillance and Preventive Maintenance			H
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E

Table 3.3.2-13: Security Generator

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.C1-18 (A-01)	3.3.1-19	D
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 302
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 302
Silencer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-13: Security Generator

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking – fatigue	Periodic Surveillance and Preventive Maintenance			H
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Strainer	Filtration	Carbon steel	Gas (ext)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Strainer	Filtration	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Tank	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A

Table 3.3.2-13: Security Generator

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring			G
Tubing	Pressure boundary	Copper alloy	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-4 (AP-12)	3.3.1-51	E, 302
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-9 (A-78)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Valve body	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E

Table 3.3.2-14-1
Gas Handling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-1: Gas Handling								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	C
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.B-3 (E-26)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-7 (AP-64)	3.3.1-31	C, 315

3.3.2-14-1: Gas Handling								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	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.A-13 (SP-46)	3.4.1-37	C
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.B-3 (E-26)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206

Table 3.3.2-14-2
Reactor Coolant System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-2: Reactor Coolant System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	C
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	C
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206

3.3.2-14-2: Reactor Coolant System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-5 (AP-39)	3.3.1-21	E
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	C

3.3.2-14-2: Reactor Coolant System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F-6 (EP-15)	3.2.1-52	C

3.3.2-14-2: Reactor Coolant System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	V.F-7 (EP-16)	3.2.1-52	C
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Strainer housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C

3.3.2-14-2: Reactor Coolant System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Valve body	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Valve body	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C

3.3.2-14-2: Reactor Coolant System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206

Table 3.3.2-14-3
Control Rod Drive System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-3: Control Rod Drive System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	C
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C

3.3.2-14-3: Control Rod Drive System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-5 (AP-39)	3.3.1-21	E
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C

3.3.2-14-3: Control Rod Drive System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F-6 (EP-15)	3.2.1-52	C
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	V.F-10 (EP-29)	3.2.1-52	C
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C

3.3.2-14-3: Control Rod Drive System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	C
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C, 206
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.A4-9 (AP-32)	3.3.1-84	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-7 (AP-64)	3.3.1-31	C, 315
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C, 206

Table 3.3.2-14-4
Residual Heat Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-4: Residual Heat Removal System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Orifice	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	V.D1-25 (EP-55)	3.2.1-37	D
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	V.E-10 (E-46)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2-8 (E-18)	3.2.1-36	D

3.3.2-14-4: Residual Heat Removal System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Sight glass	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2-8 (E-18)	3.2.1-36	D
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F-6 (EP-15)	3.2.1-52	A
Sight glass	Pressure boundary	Glass	Raw water (int)	None	None	V.F-8 (EP-28)	3.2.1-52	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	V.F-10 (EP-29)	3.2.1-52	A
Steam trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Steam trap	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2-8 (E-18)	3.2.1-36	D
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A

3.3.2-14-4: Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-16 (A-46)	3.3.1-25	E
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	D
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-7 (AP-64)	3.3.1-31	C, 315
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	V.D1-25 (EP-55)	3.2.1-37	D
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A

3.3.2-14-4: Residual Heat Removal System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	V.E-10 (E-46)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2-8 (E-18)	3.2.1-36	D
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	V.D1-25 (EP-55)	3.2.1-37	D
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206

Table 3.3.2-14-5
Standby Liquid Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management

3.3.2-14-5: Standby Liquid Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315

3.3.2-14-5: Standby Liquid Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Strainer housing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tank	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Thermowell	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

3.3.2-14-5: Standby Liquid Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.A4-9 (AP-32)	3.3.1-84	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-7 (AP-64)	3.3.1-31	C, 315
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A, 315

Table 3.3.2-14-6
Reactor Water Cleanup System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-6: Reactor Water Cleanup System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Demineralizer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Demineralizer	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	A, 315
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	A, 315
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

3.3.2-14-6: Reactor Water Cleanup System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-3 (A-71)	3.3.1-5	E
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Closed Cooling Water	VII.E3-2 (A-68)	3.3.1-46	B
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-2 (A-70)	3.3.1-23	C, 315
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.E3-1 (A-67)	3.3.1-49	B
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	C
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	A, 315
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	C

3.3.2-14-6: Reactor Water Cleanup System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-34 (E-09)	3.2.1-19	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	A, 315
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A, 315
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	A, 315
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	A, 315

3.3.2-14-6: Reactor Water Cleanup System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J-13 (AP-51)	3.3.1-93	A
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	A, 315
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	A, 315
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	A, 315
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

3.3.2-14-6: Reactor Water Cleanup System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A, 315
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-34 (E-09)	3.2.1-19	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	A, 315
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A

3.3.2-14-6: Reactor Water Cleanup System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A, 315

Table 3.3.2-14-7
Reactor Core Isolation Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-7: Reactor Core Isolation Cooling System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Orifice	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	A

3.3.2-14-7: Reactor Core Isolation Cooling System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Rupture disk	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Rupture disk	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (E-29)	3.2.1-32	E
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401

3.3.2-14-7: Reactor Core Isolation Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
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.A-13 (SP-46)	3.4.1-37	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206

**Table 3.3.2-14-8
Core Spray System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

3.3.2-14-8: Core Spray System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F-6 (EP-15)	3.2.1-52	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	V.F-10 (EP-29)	3.2.1-52	A

3.3.2-14-8: Core Spray System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-7 (AP-64)	3.3.1-31	C, 315
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206

Table 3.3.2-14-9
Reactor Building Closed Loop Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-9: Reactor Building Closed Loop Cooling Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	B
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-10 (AP-41)	3.3.1-59	C

3.3.2-14-9: Reactor Building Closed Loop Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	B
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

3.3.2-14-9: Reactor Building Closed Loop Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-4 (AP-12)	3.3.1-51	B
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

3.3.2-14-9: Reactor Building Closed Loop Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	B

**Table 3.3.2-14-10
Primary Containment
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

3.3.2-14-10: Primary Containment								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.C-1 (E-35)	3.2.1-31	C
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (E-29)	3.2.1-32	E
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Air – indoor (int)	None	None			G
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.C-1 (E-35)	3.2.1-31	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (E-29)	3.2.1-32	E

Table 3.3.2-14-11
Process Radiation Monitors
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-11: Process Radiation Monitors								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	D
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D

3.3.2-14-11: Process Radiation Monitors

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	D
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	D
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-4 (AP-12)	3.3.1-51	D
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	D

Table 3.3.2-14-12
Fuel Pool Cooling and Cleanup System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-12: Fuel Pool Cooling and Cleanup System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A, 315
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-10 (AP-41)	3.3.1-59	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-2 (A-70)	3.3.1-23	A, 315
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

3.3.2-14-12: Fuel Pool Cooling and Cleanup System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A, 315
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A, 315
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

3.3.2-14-12: Fuel Pool Cooling and Cleanup System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A, 315
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-7 (AP-64)	3.3.1-31	A, 315
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A, 315
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A, 315

Table 3.3.2-14-13
Radwaste System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-13: Radwaste System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Flow element	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315

3.3.2-14-13: Radwaste System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E

3.3.2-14-13: Radwaste System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Sight glass	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Raw water (int)	None	None	VII.J-11 (AP-50)	3.3.1-93	A
Steam trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Steam trap	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E

3.3.2-14-13: Radwaste System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Tank	Pressure boundary	Aluminum	Raw water (int)	Loss of material	One-Time Inspection	VII.G-8 (AP-83	3.3.1-62	E
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tank	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

3.3.2-14-13: Radwaste System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315

Table 3.3.2-14-14
High Pressure Coolant Injection System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-14: High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E-4 (EP-25)	3.2.1-23	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206

3.3.2-14-14: High Pressure Coolant Injection System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F-6 (EP-15)	3.2.1-52	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	V.F-10 (EP-29)	3.2.1-52	A
Steam trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Steam trap	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-7 (AP-64)	3.3.1-31	C, 315
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	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.A-13 (SP-46)	3.4.1-37	C

3.3.2-14-14: High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A, 206
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A, 206

Table 3.3.2-14-15
Containment Purge/CAD/PASS System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-15: Containment Purge/CAD/PASS System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.D2-16 (E-29)	3.2.1-32	E

3.3.2-14-15: Containment Purge/CAD/PASS System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Piping	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315

3.3.2-14-15: Containment Purge/CAD/PASS System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.D2-16 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Valve body	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315

Table 3.3.2-14-16
Main Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-16: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H-4 (S-34)	3.4.1-22	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	C

3.3.2-14-16: Main Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-6 (S-09)	3.4.1-4	A, 401
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-6 (S-09)	3.4.1-4	A, 401
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

3.3.2-14-16: Main Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	A, 401
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	C, 401
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	A, 401
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	A

3.3.2-14-16: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	C, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-6 (S-09)	3.4.1-4	A, 401

Table 3.3.2-14-17
Extraction Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-17: Extraction Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H-4 (S-34)	3.4.1-22	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Expansion joint	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
Expansion joint	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Expansion joint	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C

3.3.2-14-17: Extraction Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-6 (S-09)	3.4.1-4	A, 401
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Flow element	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
Flow element	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Flow element	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	A, 401
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A

3.3.2-14-17: Extraction Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C, 401
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-7 (S-18)	3.4.1-5	C, 401
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Orifice	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Orifice	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	A, 401
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-6 (S-09)	3.4.1-4	A, 401
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401

3.3.2-14-17: Extraction Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Orifice	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	A, 401
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.C-5 (S-15)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	A, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C

3.3.2-14-17: Extraction Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-6 (S-09)	3.4.1-4	A, 401
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-6 (S-09)	3.4.1-4	A, 401
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	A, 401
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A

3.3.2-14-17: Extraction Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-40 (S-13)	3.4.1-6	C, 401
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	A, 401
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-6 (S-09)	3.4.1-4	A, 401
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C

3.3.2-14-17: Extraction Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	A, 401
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	A, 401

3.3.2-14-17: Extraction Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.C-5 (S-15)	3.4.1-29	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	A, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-6 (S-09)	3.4.1-4	A, 401
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H

3.3.2-14-17: Extraction Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	A, 401

Table 3.3.2-14-18
Decay Heat Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-18: Decay Heat Removal System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-10 (A-52)	3.3.1-50	E, 314
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C

3.3.2-14-18: Decay Heat Removal System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.E3-1 (A-67)	3.3.1-49	E, 314
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-3 (A-71)	3.3.1-5	E
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-2 (A-70)	3.3.1-23	C, 315
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-10 (A-52)	3.3.1-50	E, 314
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E

3.3.2-14-18: Decay Heat Removal System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-10 (A-52)	3.3.1-50	E, 314
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

3.3.2-14-18: Decay Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-10 (A-52)	3.3.1-50	E, 314
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315

**Table 3.3.2-14-19
Condensate System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

3.3.2-14-19: Condensate System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H-4 (S-34)	3.4.1-22	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H-1 (S-32)	3.4.1-22	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Bolting Integrity			G
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A, 401
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A

3.3.2-14-19: Condensate System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-8 (S-41)	3.4.1-28	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-7 (S-18)	3.4.1-5	A, 401
Orifice	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring			G
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	A, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A, 401
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-8 (S-41)	3.4.1-28	A

3.3.2-14-19: Condensate System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E-35 (S-16)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A, 401
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring			G
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H

3.3.2-14-19: Condensate System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A, 401
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	A, 401
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A, 401
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A, 401
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A, 401
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A

3.3.2-14-19: Condensate System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A, 401
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	A, 401
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A, 401
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401

3.3.2-14-19: Condensate System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	A, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C

3.3.2-14-19: Condensate System								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E-35 (S-16)	3.4.1-29	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A, 401
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	A, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A, 401

Table 3.3.2-14-20
Feedwater System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-20: Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H-4 (S-34)	3.4.1-22	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A, 401
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A, 401

3.3.2-14-20: Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A, 401
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A, 401
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C

3.3.2-14-20: Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A, 401

Table 3.3.2-14-21
Feedwater Heater Vents and Drains System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-21: Feedwater Heater Vents and Drains System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H-4 (S-34)	3.4.1-22	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Orifice	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C

3.3.2-14-21: Feedwater Heater Vents and Drains System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A, 401
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A, 401
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A

3.3.2-14-21: Feedwater Heater Vents and Drains System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A, 401
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VIII.I-5 (SP-9)	3.4.1-40	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VIII.I-8 (SP-35)	3.4.1-40	A
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A, 401

3.3.2-14-21: Feedwater Heater Vents and Drains System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	C

3.3.2-14-21: Feedwater Heater Vents and Drains System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A, 401

Table 3.3.2-14-22
Circulating Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-22: Circulating Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.D-1 (A-103)	3.3.1-44	C
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.F1-1 (A-09)	3.3.1-27	E
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VIII.H-10 (S-42)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.G-36 (S-12)	3.4.1-8	E
Pump casing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VIII.H-10 (S-42)	3.4.1-28	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.G-36 (S-12)	3.4.1-8	E

3.3.2-14-22: Circulating Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Tank	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.G-36 (S-12)	3.4.1-8	E
Tubing	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-16 (A-46)	3.3.1-25	E
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.A-4 (SP-31)	3.4.1-32	E
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VIII.H-10 (S-42)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.G-36 (S-12)	3.4.1-8	E

Table 3.3.2-14-23
Turbine Building Closed Loop Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-23: Turbine Building Closed Loop Cooling System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C2-14 (A-25)	3.3.1-47	E, 311
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B

3.3.2-14-23: Turbine Building Closed Loop Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Plastic	Air – indoor (ext)	None	None			F
Tank	Pressure boundary	Plastic	Treated water (int)	None	None			F
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	B
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-4 (AP-12)	3.3.1-51	B
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

3.3.2-14-23: Turbine Building Closed Loop Cooling System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.C2-6 (AP-43)	3.3.1-84	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-4 (AP-12)	3.3.1-51	B

**Table 3.3.2-14-24
Vacuum Priming and Air Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

3.3.2-14-24: Vacuum Priming and Air Removal System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-10 (AP-41)	3.3.1-59	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C

3.3.2-14-24: Vacuum Priming and Air Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J-13 (AP-51)	3.3.1-93	A
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315

3.3.2-14-24: Vacuum Priming and Air Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

3.3.2-14-24: Vacuum Priming and Air Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.A4-9 (AP-32)	3.3.1-84	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-7 (AP-64)	3.3.1-31	C, 315
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315

Table 3.3.2-14-25
Service/Instrument/Breathing Air System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-25: Service/Instrument/Breathing Air System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Piping	Pressure boundary	Copper alloy	Air – treated (int)	None	None	VII.J-3 (AP-8)	3.3.1-98	A
Valve body	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy	Air – treated (int)	None	None	VII.J-3 (AP-8)	3.3.1-98	A

Table 3.3.2-14-26
Turbine Lube Oil System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-26: Turbine Lube Oil System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E

3.3.2-14-26: Turbine Lube Oil System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	VII.J-10 (AP-15)	3.3.1-93	A
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Thermowell	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-14 (AP-59)	3.3.1-33	E
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
Tubing	Pressure boundary	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-3 (SP-32)	3.4.1-18	E

3.3.2-14-26: Turbine Lube Oil System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-3 (SP-32)	3.4.1-18	E

Table 3.3.2-14-27
Secondary Plant Drains
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-27: Secondary Plant Drains								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

3.3.2-14-27: Secondary Plant Drains								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

3.3.2-14-27: Secondary Plant Drains

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315

Table 3.3.2-14-28
Raw Water Treatment System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-28: Raw Water Treatment System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E

3.3.2-14-28: Raw Water Treatment System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Piping	Pressure boundary	Carbon steel with plastic liner	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel with plastic liner	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

3.3.2-14-28: Raw Water Treatment System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Raw water (int)	None	None	VII.J-11 (AP-50)	3.3.1-93	A
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	One-Time Inspection	VII.C1-9 (A-44)	3.3.1-81	E
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

3.3.2-14-28: Raw Water Treatment System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Valve body	Pressure boundary	Carbon steel with plastic liner	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel with plastic liner	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E

Table 3.3.2-14-29
Contaminated Equipment Drains
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-29: Contaminated Equipment Drains								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Sight glass	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E

3.3.2-14-29: Contaminated Equipment Drains								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Raw water (int)	None	None	VII.J-11 (AP-50)	3.3.1-93	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E

Table 3.3.2-14-30
Service Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-30: Service Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.D-1 (A-103)	3.3.1-44	C
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.F1-1 (A-09)	3.3.1-27	E
Orifice	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Orifice	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A

3.3.2-14-30: Service Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Piping	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-15 (A-54)	3.3.1-79	E
Piping	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B

3.3.2-14-30: Service Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-15 (A-54)	3.3.1-79	E
Strainer housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Tank	Pressure boundary	Plastic	Air – indoor (ext)	None	None			F
Tank	Pressure boundary	Plastic	Raw water (int)	None	None			F
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

3.3.2-14-30: Service Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-15 (A-54)	3.3.1-79	E
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Valve body	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VI.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.C1-11 (A-51)	3.3.1-85	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

3.3.2-14-30: Service Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1-1 (A-09)	3.3.1-27	E
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-15 (A-54)	3.3.1-79	E
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B

Table 3.3.2-14-31
Auxiliary Gas Treatment System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-31: Auxiliary Gas Treatment System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Duct	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Duct	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G

Table 3.3.2-14-32
Reactor Building Ventilation System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-32: Reactor Building Ventilation System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3-4 (A-105)	3.3.1-55	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3-2 (A-10)	3.3.1-56	A
Duct	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3-2 (A-10)	3.3.1-56	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3-2 (A-10)	3.3.1-56	A

3.3.2-14-32: Reactor Building Ventilation System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flow element	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F3-20 (A-25)	3.3.1-47	E, 312
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F3-16 (A-46)	3.3.1-25	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-3 (A-65)	3.3.1-82	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F3-8 (AP-34)	3.3.1-51	E, 312
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3-2 (A-10)	3.3.1-56	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (E-29)	3.2.1-32	E

3.3.2-14-32: Reactor Building Ventilation System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F3-20 (A-25)	3.3.1-47	E, 312
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F3-1 (A-09)	3.3.1-27	E
Piping	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	D
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3-2 (A-10)	3.3.1-56	A
Strainer housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F3-20 (A-25)	3.3.1-47	E, 312

3.3.2-14-32: Reactor Building Ventilation System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F3-16 (A-46)	3.3.1-25	E
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	D
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F3-15 (AP-12)	3.3.1-51	E,312
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3-2 (A-10)	3.3.1-56	A
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F3-20 (A-25)	3.3.1-47	E, 312
Valve body	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A

3.3.2-14-32: Reactor Building Ventilation System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.C1-11 (A-51)	3.3.1-85	C
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F3-1 (A-09)	3.3.1-27	E
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	D

Table 3.3.2-14-33
Turbine Building Ventilation System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-33: Turbine Building Ventilation System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-4 (A-105)	3.3.1-55	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-2 (A-10)	3.3.1-56	A
Flow element	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Flow element	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F2-18 (A-25)	3.3.1-47	E, 312

3.3.2-14-33: Turbine Building Ventilation System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F2-14 (A-46)	3.3.1-25	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-3 (A-65)	3.3.1-82	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-8 (AP-34)	3.3.1-51	E, 312
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-2 (A-10)	3.3.1-56	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F2-18 (A-25)	3.3.1-47	E, 312

3.3.2-14-33: Turbine Building Ventilation System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-2 (A-10)	3.3.1-56	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Strainer housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F2-14 (A-46)	3.3.1-25	E
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	D
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F2-13 (AP-12)	3.3.1-51	E, 312
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-2 (A-10)	3.3.1-56	A

3.3.2-14-33: Turbine Building Ventilation System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F2-18 (A-25)	3.3.1-47	E, 312
Valve body	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VI.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.C1-11 (A-51)	3.3.1-85	C
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D

Table 3.3.2-14-34
Drywell Ventilation and Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-34: Drywell Ventilation and Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3-4 (A-105)	3.3.1-55	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F3-8 (AP-34)	3.3.1-51	E, 312
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3-2 (A-10)	3.3.1-56	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F3-20 (A-25)	3.3.1-47	E, 312

3.3.2-14-34: Drywell Ventilation and Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3-2 (A-10)	3.3.1-56	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F3-20 (A-25)	3.3.1-47	E, 312
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3-2 (A-10)	3.3.1-56	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F3-20 (A-25)	3.3.1-47	E, 312
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F3-15 (AP-12)	3.3.1-51	E, 312

Table 3.3.2-14-35
Administration Building Ventilation and Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-35: Administration Building Ventilation and Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-4 (A-105)	3.3.1-55	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-2 (A-10)	3.3.1-56	A
Flow element	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Flow element	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F2-18 (A-25)	3.3.1-47	E, 312

3.3.2-14-35: Administration Building Ventilation and Cooling System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F2-14 (A-46)	3.3.1-25	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-4 (A-66)	3.3.1-84	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-3 (A-65)	3.3.1-82	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.F2-15 (AP-43)	3.3.1-84	C, 312
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-8 (AP-34)	3.3.1-51	E, 312
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-2 (A-10)	3.3.1-56	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A

3.3.2-14-35: Administration Building Ventilation and Cooling System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F2-18 (A-25)	3.3.1-47	E, 312
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-2 (A-10)	3.3.1-56	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F2-18 (A-25)	3.3.1-47	E, 312
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-2 (A-10)	3.3.1-56	A
Strainer housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F2-18 (A-25)	3.3.1-47	E, 312
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-2 (A-10)	3.3.1-56	A

3.3.2-14-35: Administration Building Ventilation and Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F2-18 (A-25)	3.3.1-47	E,312
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F2-14 (A-46)	3.3.1-25	E
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	D
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F2-13 (AP-12)	3.3.1-51	E, 312
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-2 (A-10)	3.3.1-56	A
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F2-18 (A-25)	3.3.1-47	E, 312

3.3.2-14-35: Administration Building Ventilation and Cooling System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.F2-15 (AP-43)	3.3.1-84	A, 312
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F2-13 (AP-12)	3.3.1-51	E, 312

Table 3.3.2-14-36
Screenwell/Water Treatment Ventilation and Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-36: Screenwell/Water Treatment Ventilation and Cooling System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2-4 (A-105)	3.3.1-55	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.F2-15 (AP-43)	3.3.1-84	C, 312
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.F1-8 (AP-34)	3.3.1-51	E, 312

Table 3.3.2-14-37
Plumbing, Sanitary, and Lab
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-37: Plumbing, Sanitary, and Lab

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-10 (AP-41)	3.3.1-59	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-5 (A-64)	3.3.1-77	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

3.3.2-14-37: Plumbing, Sanitary, and Lab								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	One-Time Inspection	VII.C1-9 (A-44)	3.3.1-81	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	C

Table 3.3.2-14-38
Fire Protection System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-38: Fire Protection System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Flow element	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Piping	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VI.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B

3.3.2-14-38: Fire Protection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Sight glass	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Raw water (int)	None	None	VII.J-11 (AP-50)	3.3.1-93	A
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

3.3.2-14-38: Fire Protection System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Fire Water System	VII.G-12 (A-45)	3.3.1-70	B
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Fire Water System	VII.G-12 (A-45)	3.3.1-70	B
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.G-13 (A-47)	3.3.1-84	A
Valve body	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VI.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A

Table 3.3.2-14-39
City Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-39: City Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

3.3.2-14-39: City Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	One-Time Inspection	VII.C1-9 (A-44)	3.3.1-81	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	C

Table 3.3.2-14-40
Auxiliary Boiler and Accessories
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-40: Auxiliary Boiler and Accessories								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 313
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 313
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

3.3.2-14-40: Auxiliary Boiler and Accessories

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Auxiliary Systems	VII.C2-11 (AP-60)	3.3.1-46	E, 313
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-10 (A-52)	3.3.1-50	E, 313
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 313

Table 3.3.2-14-41
Emergency Diesel Generator
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-41: Emergency Diesel Generator								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Compressor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Compressor housing	Pressure boundary	Carbon steel	Air – untreated (int)	Cracking – fatigue	One-Time Inspection			H
Compressor housing	Pressure boundary	Carbon steel	Air – untreated (int)	Loss of material	One-Time Inspection	VII.H2-21 (A-23)	3.3.1-71	E, 310
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – untreated (int)	Cracking – fatigue	One-Time Inspection			H
Piping	Pressure boundary	Carbon steel	Air – untreated (int)	Loss of material	One-Time Inspection	VII.H2-21 (A-23)	3.3.1-71	E, 310

3.3.2-14-41: Emergency Diesel Generator

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H2-24 (A-30)	3.3.1-20	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air – untreated (int)	Cracking – fatigue	One-Time Inspection			H
Valve body	Pressure boundary	Carbon steel	Air – untreated (int)	Loss of material	One-Time Inspection	VII.H2-21 (A-23)	3.3.1-71	E, 310
Valve body	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H2-24 (A-30)	3.3.1-20	E

Table 3.3.2-14-42
Main Turbine Generator
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-42: Main Turbine Generator								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H-4 (S-34)	3.4.1-22	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-14 (SP-25)	3.4.1-7	E
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.G-6 (S-17)	3.4.1-12	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A

3.3.2-14-42: Main Turbine Generator								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-14 (SP-25)	3.4.1-7	E
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 304
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-6 (S-09)	3.4.1-4	C, 401
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Piping	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-9 (SP-38)	3.4.1-19	E
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A

3.3.2-14-42: Main Turbine Generator								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-14 (SP-25)	3.4.1-7	E
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-14 (SP-25)	3.4.1-7	E
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VIII.I-5 (SP-9)	3.4.1-40	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	VIII.I-6 (SP-10)	3.4.1-40	A
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 304
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Tank	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-14 (SP-25)	3.4.1-7	E

3.3.2-14-42: Main Turbine Generator

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Thermowell	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-9 (SP-38)	3.4.1-19	E
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VIII.E-24 (SP-39)	3.4.1-25	E, 304
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VIII.E-16 (SP-8)	3.4.1-26	E, 304
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-9 (SP-38)	3.4.1-19	E
Turbine casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Turbine casing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401

3.3.2-14-42: Main Turbine Generator								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 304
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-6 (S-09)	3.4.1-4	C, 401
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-9 (SP-38)	3.4.1-19	E
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VIII.E-24 (SP-39)	3.4.1-25	E, 304

**Table 3.3.2-14-43
Sample System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

3.3.2-14-43: Sample System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I-4 (AP-27)	3.3.1-43	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.E3-1 (A-67)	3.3.1-49	D
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (ext)	Cracking	Water Chemistry Control – BWR	VII.E3-3 (A-71)	3.3.1-5	E
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (ext)	Loss of material	Water Chemistry Control – BWR	VII.A4-2 (A-70)	3.3.1-23	C, 315
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	C

3.3.2-14-43: Sample System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	D
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	D
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

3.3.2-14-43: Sample System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J-13 (AP-51)	3.3.1-93	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A

3.3.2-14-43: Sample System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2-32 (E-10)	3.2.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C, 315
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	D
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C, 315

Table 3.3.2-14-44
Steam Seal System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

3.3.2-14-44: Steam Seal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H-4 (S-34)	3.4.1-22	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C, 401
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue			H

3.3.2-14-44: Steam Seal System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C, 401

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 system is addressed in this section (the system description is available in the referenced section).

- condensate storage system (Section 2.3.4.1)

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 Storage System—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 Storage System

Materials

Condensate storage system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Condensate storage 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 storage system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the condensate storage system components.

- Bolting Integrity
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring
- One-Time Inspection
- Water Chemistry Control – BWR

3.4.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 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 Loss of Material Due to General, Pitting, and Crevice Corrosion

1. Loss of material due to general, pitting and crevice corrosion for carbon steel piping and piping components and tanks exposed to treated water and for carbon steel piping and components exposed to steam is an aging effect requiring management in the steam and power conversion and other systems at JAFNPP, which is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

2. Loss of material due to general, pitting and crevice corrosion in steel piping and components exposed to lubricating oil is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

3.4.2.2.3 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC), and Fouling

Loss of material due to general, pitting, crevice, and MIC, and fouling in steel piping and components in the steam and power conversion systems exposed to raw water is managed by the Periodic Surveillance and Preventive Maintenance Program. The program includes visual inspections and other NDE techniques to manage loss of material of the components. These inspections will manage the aging effect of loss of material such that the intended function of the components will not be affected.

3.4.2.2.4 Reduction of Heat Transfer due to Fouling

1. Reduction of heat transfer due to fouling could occur for stainless steel and copper alloy heat exchanger tubes exposed to treated water. The steam and power conversion systems at JAFNPP have no heat exchanger tubes with an intended function of heat transfer and associated aging effect of fouling. However, reduction of heat transfer is managed by the Water Chemistry Control – BWR Program for copper alloy heat exchanger tubes in the high pressure coolant injection system. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

2. Reduction of heat transfer due to fouling could occur for steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. The steam and power conversion systems at JAFNPP have no heat exchanger tubes with an intended function of heat transfer and associated aging effect of fouling. This item is not applicable to JAFNPP.

3.4.2.2.5 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

1. Loss of material due to general, pitting, and crevice corrosion and MIC could occur in carbon steel (with or without coating or wrapping) piping, piping components, piping elements and tanks exposed to soil. The steam and power conversion systems at JAFNPP have no carbon steel components that are exposed to soil. This item is not applicable to JAFNPP.

2. Loss of material due to general, pitting, crevice corrosion and MIC for carbon steel heat exchanger components exposed to lubricating oil is an aging effect requiring management in the steam and power conversion systems at JAFNPP and is managed by the Oil Analysis Program. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

3.4.2.2.6 Cracking due to Stress Corrosion Cracking (SCC)

Cracking due to SCC in stainless steel components exposed to steam or treated water is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3.4.2.2.7 Loss of Material due to Pitting and Crevice Corrosion

1. Loss of material due to pitting and crevice corrosion for stainless steel components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The steam and power conversion systems at JAFNPP have no aluminum or copper alloy components with intended functions that are exposed to treated water. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

2. Loss of material from pitting and crevice corrosion for stainless steel piping and piping components exposed to a soil environment is managed by the Buried Piping and Tanks Inspection Program. The Buried Piping and Tanks Inspection Program will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel, copper alloy, gray cast iron, and stainless steel components. Buried components will be inspected when excavated during maintenance. An inspection will be performed within ten years of entering the period of extended operation, unless an opportunistic inspection occurred within this ten-year period.

3. Loss of material due to pitting and crevice corrosion for copper alloy piping and components exposed to lubricating oil is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

3.4.2.2.8 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

Loss of material due to pitting, crevice, and MIC in stainless steel piping and components exposed to lubricating oil is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program. The steam and power conversion systems at JAFNPP have no stainless steel heat exchanger components exposed to lubricating oil.

3.4.2.2.9 Loss of Material due to General, Pitting, Crevice, and Galvanic Corrosion

Loss of material due to general, pitting, crevice, and galvanic corrosion for steel heat exchanger components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3.4.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of JAFNPP 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, NUREG-1801 Vol. 1

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	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA. See Section 3.4.2.2.1.
3.4.1-2	Steel piping, piping components, and piping elements exposed to steam	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in steel components exposed to steam is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. This line applies to components in the ESF systems listed in Tables 3.2.2 and to components in scope under criterion 10 CFR 54.4(a)(2) listed in series 3.3.2-14-xx tables. See Section 3.4.2.2.2 item 1.
3.4.1-3	PWR only				

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-4	Steel piping, piping components, and piping elements exposed to treated water	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in steel components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. See Section 3.4.2.2.2 Item 1.
3.4.1-5	Steel heat exchanger components exposed to treated water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in steel heat exchanger components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables. See Section 3.4.2.2.9.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-6	Steel and stainless steel tanks exposed to treated water	Loss of material due to general (steel only) pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in steel and stainless steel tanks exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. See Section 3.4.2.2.2 item 1 and Section 3.4.2.2.7 item 1.
3.4.1-7	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material in steel components exposed to lubricating oil is managed by the Oil Analysis Program. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables. See Section 3.4.2.2.2 item 2.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-8	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling	Plant specific	Yes, plant specific	The Periodic Surveillance and Preventive Maintenance Program manages loss of material in steel components exposed to raw water. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables. See Section 3.4.2.2.3.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-9	Stainless steel and copper alloy heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The reduction of heat transfer in copper alloy heat exchanger tubes exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. The components to which this NUREG-1801 line item applies are in the high pressure coolant injection system in Table 3.2.2-4. There are no stainless steel heat exchanger tubes exposed to treated water in the steam and power conversion systems. See Section 3.4.2.2.4 item 1.
3.4.1-10	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no steel, stainless steel or copper alloy heat exchanger tubes exposed to lubricating oil with intended functions in the steam and power conversion systems. See Section 3.4.2.2.4 item 2.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-11	Buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	Not applicable. There are no steel components exposed to soil in the steam and power conversion systems. See Section 3.4.2.2.5 item 1.
3.4.1-12	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material in steel heat exchanger components exposed to lubricating oil is managed by the Oil Analysis Program. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables. See Section 3.4.2.2.5 item 2.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-13	Stainless steel piping, piping components, piping elements exposed to steam	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Cracking in stainless steel components exposed to steam is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. The components to which this NUREG-1801 line item applies are either in the ESF systems in Tables 3.2.2, or they are components in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables. See Section 3.4.2.2.6.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-14	Stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Cracking in stainless steel components exposed to treated water > 140°F is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. The components to which this NUREG-1801 line item applies are in scope under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-14-xx tables. See Section 3.4.2.2.6.
3.4.1-15	Aluminum and copper alloy piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no aluminum or copper alloy components with intended functions in the steam and power conversion systems. See Section 3.4.2.2.7 item 1.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-16	Stainless steel piping, piping components, and piping elements; tanks, and heat exchanger components exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in stainless steel components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. See Section 3.4.2.2.7 item 1.
3.4.1-17	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	Plant specific	Yes, plant specific	The Buried Piping and Tanks Inspection Program manages loss of material in stainless steel components exposed to soil. See Section 3.4.2.2.7 item 2.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-18	Copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material in copper alloy components exposed to lubricating oil is managed by the Oil Analysis Program. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables. See Section 3.4.2.2.7 item 3.
3.4.1-19	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material in stainless steel components exposed to lubricating oil is managed by the Oil Analysis Program. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables. See Section 3.4.2.2.8.
3.4.1-20	Steel tanks exposed to air – outdoor (external)	Loss of material/ general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Not applicable. There are no steel tanks exposed to outdoor air with intended functions in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-21	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable. High-strength steel closure bolting is not used in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-22	Steel bolting and closure bolting exposed to air with steam or water leakage, air – outdoor (external), or air – indoor uncontrolled (external);	Loss of material due to general, pitting and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Consistent with NUREG-1801. The Bolting Integrity Program manages the loss of material for steel bolting. Loss of preload is not an applicable aging effect. Loss of preload is a design-driven effect and not an aging effect requiring management. Bolting at JAFNPP is standard grade B7 low alloy steel, or similar material, except in rare specialized applications such as where stainless steel bolting is utilized. Loss of preload due to stress relaxation (creep) would only be a concern in very high temperature applications (> 700°F), as stated in the ASME Code, Section II, Part D, Table 4. No JAFNPP bolting operates at > 700°F. Therefore, loss of preload due to stress relaxation (creep) is not an applicable aging effect for steam and power conversion systems. Other issues that may result in pressure boundary joint leakage are improper design or maintenance issues. (continued)

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
					Improper bolting application (design) and maintenance issues are current plant operational concerns and not related to aging effects or mechanisms that require management during the period of extended operation. As described in the Bolting Integrity Program, JAFNPP has taken actions to address NUREG–1339, *Resolution to Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants.* These actions include implementation of good bolting practices in accordance with EPRI NP-5067, Good Bolting Practices. Proper joint preparation and make-up in accordance with industry standards s expected to preclude loss of preload. This has been confirmed by operating experience at JAFNPP.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-23	Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	Not applicable. There are no stainless steel components exposed to closed cycle cooling water in the steam and power conversion systems.
3.4.1-24	Steel heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable. There are no steel heat exchanger components exposed to closed cycle cooling water in the steam and power conversion systems.
3.4.1-25	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	The Water Chemistry Control – Auxiliary Systems Program manages loss of material for stainless steel components. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-26	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	The Water Chemistry Control – Auxiliary Systems Program manages loss of material for copper alloy components. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables.
3.4.1-27	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Not applicable. There are no heat exchanger tubes exposed to closed cycle cooling water in the steam and power conversion systems.
3.4.1-28	Steel external surfaces exposed to air – indoor uncontrolled (external), condensation (external), or air outdoor (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The External Surfaces Monitoring Program manages the loss of material for external surfaces of steel components.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-29	Steel piping, piping components, and piping elements exposed to steam or treated water	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Consistent with NUREG-1801. The Flow-Accelerated Corrosion Program manages loss of material in steel components exposed to steam or treated water. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables.
3.4.1-30	Steel piping, piping components, and piping elements exposed to air outdoor (internal) or condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable. There are no steel components with intended functions in the steam and power conversion systems with internal surfaces exposed to outdoor air or condensation.
3.4.1-31	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. There are no steel heat exchanger components with intended functions exposed to raw water in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-32	Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Open-Cycle Cooling Water System	No	The Periodic Surveillance and Preventive Maintenance Program manages loss of material for copper alloy components exposed to raw water through periodic visual inspections. There are no stainless steel components exposed to raw water with an intended function of pressure boundary in the steam and power conversion systems. The only components to which this NUREG-1801 line item applies are included in scope only under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables.
3.4.1-33	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. There are no stainless steel heat exchanger components exposed to raw water in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-34	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Not applicable. There are no heat exchanger tubes exposed to raw water with an intended function of heat transfer in the steam and power conversion systems.
3.4.1-35	Copper alloy >15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no copper alloy components subject to selective leaching in the steam and power conversion systems.
3.4.1-36	Gray cast iron piping, piping components, and piping elements exposed to soil, treated water, or raw water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no gray cast iron components exposed to soil, treated water, or raw water with intended functions in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-37	Steel, stainless steel, and nickel-based alloy piping, piping components, and piping elements exposed to steam	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Consistent with NUREG-1801. The loss of material in steel and stainless steel components exposed to steam is managed by the Water Chemistry Control – BWR Program. There are no nickel alloy components exposed to steam in the steam and power conversion systems. The components to which this NUREG-1801 line item applies are either in the ESF systems in series 3.2.2-x tables, or they are components in scope under criterion 10 CFR 54.4(a)(2), listed in series 3.3.2-14-xx tables.
3.4.1-38	PWR only				
3.4.1-39	PWR only				
3.4.1-40	Glass piping elements exposed to air, lubricating oil, raw water, and treated water	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. The components to which this NUREG-1801 line item applies are in scope under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-14-xx tables.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-41	Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.4.1-42	Steel piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. There are no steel components exposed to air – indoor controlled in the steam and power conversion systems. All indoor air environments are conservatively considered to be uncontrolled.
3.4.1-43	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.4.1-44	Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Not applicable. There are no steel, stainless steel, aluminum, or copper alloy components exposed to gas in the steam and power conversion systems.

Notes for Table 3.4.2-1

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

401. The effectiveness of the Water Chemistry Control – BWR Program will be verified by the One-Time Inspection Program.

Table 3.4.2-1
Condensate Storage System
Summary of Aging Management

3.4.2-1: Condensate Storage System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H-4 (S-34)	3.4.1-22	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H-1 (S-32)	3.4.1-22	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Bolting Integrity			G
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A, 401
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring			G
Piping	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Water Chemistry Control – BWR			G

3.4.2-1: Condensate Storage System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A, 401
Screen	Filtration	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring			G
Screen	Filtration	Stainless steel	Condensation (int)	Loss of material	Water Chemistry Control – BWR			G
Tank	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring			G
Tank	Pressure boundary	Stainless steel	Concrete (ext)	None	None	VIII.I-11 (SP-13)	3.4.1-43	A
Tank	Pressure boundary	Stainless steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VIII.E-28 (SP-37)	3.4.1-17	E
Tank	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-40 (S-13)	3.4.1-6	A, 401
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A

3.4.2-1: Condensate Storage System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A, 401
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A, 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).

- reactor building and primary containment (Section 2.4.1)
- water control structures (Section 2.4.2)
- turbine building complex and yard structures (Section 2.4.3)
- bulk commodities (Section 2.4.4)

Table 3.5.1, Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for structures and component supports. Hyperlinks are provided to the program evaluations in Appendix B.

3.5.2 Results

The following tables summarize the results of aging management reviews and the NUREG-1801 comparison for structures and component supports.

- Table 3.5.2-1 Reactor Building and Primary Containment—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 Complex 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 Reactor Building and Primary Containment

Materials

Reactor building and primary containment components subject to aging management review are constructed of the following materials.

- aluminum
- carbon steel
- concrete
- concrete block
- elastomer
- galvanized steel
- lubrite
- rubber
- stainless steel

Environment

Reactor building and primary containment components subject to aging management review are exposed to the following environments.

- exposed to fluid environment
- exposed to weather
- protected from weather

Aging Effects Requiring Management

The following aging effects associated with reactor building and primary containment components require management.

- change in material properties
- cracking
- cracking – cyclic loading
- cracking – fatigue
- loss of material

Aging Management Programs

The following programs are credited for managing the effects of aging on reactor building and primary containment components.

- Containment Inservice Inspection (CII)
- Containment Leak Rate
- Fire Protection
- Inservice Inspection (ISI-IWF)

- Periodic Surveillance and Preventive Maintenance
- Masonry Wall
- Structures Monitoring
- Water Chemistry Control – BWR

3.5.2.1.2 Water Control Structures

Materials

Water control structures components subject to aging management review are constructed of the following materials.

- carbon steel
- concrete
- concrete block
- galvanized steel
- stainless steel

Environment

Water control structures components subject to aging management review are exposed to the following environments.

- exposed to fluid environment
- exposed to weather
- protected from weather

Aging Effects Requiring Management

The following aging effects associated with water control structures components require management.

- cracking
- loss of material

Aging Management Programs

The following aging management programs are credited for managing the aging effects for the water control structures components.

- Fire Protection
- Masonry Wall
- Structures Monitoring

3.5.2.1.3 Turbine Building Complex and Yard Structures

Materials

Turbine building complex and yard structures components subject to aging management review are constructed of the following materials.

- carbon steel
- concrete
- concrete block
- galvanized steel

Environment

Turbine building complex and yard structures components subject to aging management review are exposed to the following environments.

- exposed to weather
- protected from weather

Aging Effects Requiring Management

The following aging effects associated with turbine building complex and yard structures components require management.

- cracking
- loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on turbine building complex and yard structures components.

- Fire Protection
- Masonry Wall
- Structures Monitoring

3.5.2.1.4 Bulk Commodities

Materials

Bulk commodities subject to aging management review are constructed of the following materials.

- aluminum
- carbon steel
- cera fiber, cera blanket

- concrete
- elastomer/rubber
- fiberglass/calcium silicate
- galvanized steel
- polyvinyl chloride (PVC)
- pyrocrete
- stainless steel

Environment

Bulk commodities subject to aging management review are exposed to the following environments.

- exposed to fluid environment
- exposed to weather
- protected from weather

Aging Effects Requiring Management

The following aging effects associated with bulk commodities require management.

- change in material properties
- cracking
- cracking/delamination
- loss of material
- separation

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on bulk commodities.

- Fire Protection
- Fire Water System
- ISI-IWF
- Structures Monitoring
- Water Chemistry Control – BWR

3.5.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues. Section 3.5.2.2 of NUREG 1800 discusses these aging effects that require further evaluation. The following sections, numbered in accordance with the corresponding discussions in NUREG-1800, explain the JAFNPP approach to these 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 Aging of Inaccessible Concrete Areas

JAFNPP has a Mark I free-standing steel containment located within the reactor building. Inaccessible and accessible concrete areas are designed in accordance with American Concrete Institute (ACI) specification ACI 318-63, Building Code Requirements for Reinforced Concrete, which results in low permeability and resistance to aggressive chemical solutions by requiring the following.

- high cement content
- low water-to-cement ratio
- proper curing
- adequate air entrainment

JAFNPP concrete also meets requirements of later ACI guide ACI 201.2R-77, Guide to Durable Concrete, since both documents use the same American Society for Testing and Material (ASTM) standards for selection, application and testing of concrete.

The 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 between 3% and 5% and a low water/cement ratio (0.50 or less). Although specified water/cement ratios fall outside the established range of 0.35 to 0.45, given all remaining parameters for durable concrete mix design, JAFNPP concrete meets the quality requirements of ACI to ensure acceptable concrete is obtained. Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not applicable for concrete in inaccessible areas. The absence of concrete aging effects is confirmed under the Structures Monitoring Program.

3.5.2.2.1.2 Cracks and Distortion due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, Cracking and Differential Settlement due to Erosion of Porous Concrete Subfoundations, if Not Covered by Structures Monitoring Program

JAFNPP does not rely on a dewatering system for control of settlement. Structures are founded on sandstone bedrock. JAFNPP containment was not identified in IN 97-11 as a plant susceptible to erosion of porous concrete subfoundations. JAFNPP groundwater is not aggressive and there is no indication that groundwater chemistry has significantly changed and no changes in groundwater conditions have been observed.

As a result, cracking and distortion due to increased stress level from settlement and reduction of foundation strength cracking and differential settlement due to erosion of porous concrete subfoundation are not aging effects requiring management for JAFNPP concrete structures.

3.5.2.2.1.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

Not applicable. NUREG-1801 Volume 2 items referencing this issue are associated with concrete containments. JAFNPP is a Mark I steel containment.

3.5.2.2.1.4 Loss of Material due to General, Pitting and Crevice Corrosion

JAFNPP containment is a Mark I steel containment located within the reactor building. JAFNPP reactor building concrete in contact with the drywell shell is designed in accordance with specification ACI 318-63, Building Code Requirements for Reinforced Concrete. The concrete meets requirements of later ACI guide ACI 201.2R-77 since both documents use the same ASTM standards for selection, application and testing of concrete. Concrete is monitored for cracks under the Structures Monitoring Program. The drywell steel shell and the moisture barrier where the drywell shell becomes embedded in the drywell concrete floor are inspected in accordance with the Containment Inservice Inspection – IWE Program and Structures Monitoring Program.

To prevent corrosion of the lower part of the drywell shell, 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 the drywell shell, assuming a crack in the concrete, since the concrete at this location is greater than eight feet thick and poured in multiple horizontal planes. The sand cushion area is drained to protect the exterior surface of the drywell shell at the sand cushion interface from water that might enter the air gap. Therefore, significant corrosion of the drywell shell is not expected.

3.5.2.2.1.5 Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature

JAFNPP is a Mark I containment and does not incorporate prestressed concrete in its design. Therefore, loss of prestress due to relaxation, shrinkage, creep, and elevated temperature do not apply.

3.5.2.2.1.6 Cumulative Fatigue Damage

TLAA are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4. Fatigue TLAAs for the torus and associated penetrations are evaluated as documented in Section 4.6.

3.5.2.2.1.7 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 JAFNPP are penetration sleeves and bellows.

Stress corrosion cracking (SCC) is an aging mechanism that requires the simultaneous action of a corrosive environment, sustained tensile stress, and a susceptible material. Elimination of any one of these elements will eliminate susceptibility to SCC. Stainless steel elements of primary containment and the containment vacuum breakers system, including dissimilar welds, are susceptible to SCC. However, these elements are located inside the containment drywell or outside the drywell, in the reactor building, and are not subject to corrosive environment as discussed below.

The drywell is made inert with nitrogen to render the primary containment atmosphere non-flammable by maintaining the oxygen content below 4% by volume during normal operation. The normal operating average temperature inside the drywell is less than 139°F and the relative humidity range is 20–40%. The reactor building normal operating temperature range is 65°F–92°F, and relative humidity is 100% maximum. Both the containment atmosphere and indoor air environments are non-corrosive (chlorides < 150 ppb, sulfates < 100 ppb, and fluorides < 150 ppb). Thus SCC is not expected to occur in the containment penetration bellows, penetration sleeves, and dissimilar metal welds. A review of plant operating experience did not identify cracking of the components, and primary containment leakage has not been identified as a concern. Therefore the existing Containment Leak Rate Program and Containment Inservice Inspection – IWE are adequate to detect cracking. Observed conditions that have the potential for impacting an intended function are evaluated or corrected in accordance with the corrective action process. The Containment

Inservice Inspection – IWE and Containment Leak Rate programs are described in Appendix B.

3.5.2.2.1.8 Cracking due to Cyclic Loading

Cyclic loading can lead to cracking of steel and stainless steel penetration bellows, and dissimilar metal welds of BWR containments and BWR suppression pool shell and downcomers.

With proper design, cracking due to cyclic loading is not expected to occur in the drywell, torus and associated penetration bellows, penetration sleeves, unbraced downcomers, and dissimilar metal welds. JAFNPP has experienced cracking of the torus shell near one column support due to hydrodynamic loads of the turbine exhaust pipe during HPCI operation, coupled with the highly restrained condition of the torus shell at the torus column support. The condition was not the effect of aging but rather the effect of inadequate design that led to cracking well before the end of the original license term. A review of plant operating experience did not identify any other cracking of these components, and primary containment leakage has not been identified as a concern. Nonetheless, the existing Containment Leak Rate Program with augmented ultrasonic exams and Containment Inservice Inspection – IWE will continue to be used to detect cracking. Observed conditions that have the potential for impacting an intended function are evaluated or corrected in accordance with the corrective action process. The Containment Inservice Inspection – IWE and Containment Leak Rate programs are described in Appendix B.

3.5.2.2.1.9 Loss of Material (Scaling, Cracking, and Spalling) due to Freeze-Thaw

JAFNPP has a Mark I free-standing steel containment located within the reactor building. Loss of material (scaling, cracking, and spalling) due to freeze-thaw is applicable only to concrete containments exposed to this environment. Therefore, loss of material and cracking due to freeze-thaw do not apply.

3.5.2.2.1.10 Cracking due to Expansion and Reaction with Aggregate, and Increase in Porosity and Permeability due to Leaching of Calcium Hydroxide

JAFNPP has a Mark I free-standing steel containment located within the reactor building. In accordance with NUREG-1801, aging management is not required because JAFNPP containment concrete (basemat) is designed in accordance with specification ACI 318-63, Building Code Requirements for Reinforced Concrete and concrete specification requires that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM C-289 and C-295.

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 of Structures Not Covered by Structures Monitoring Program

JAFNPP concrete structures subject to aging management review are included in the Structures Monitoring program and supplemented by other aging management programs as appropriate. This is true for concrete items even if the aging management review did not identify aging effects requiring management. Aging effects discussed below for structural steel items are also addressed by the structures monitoring program. Additional discussion of specific aging effects follows.

1. Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling) Due to Corrosion of Embedded Steel for Groups 1-5, 7, 9 Structures

   The aging mechanisms associated with cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are applicable only to below-grade concrete/grout structures. The below-grade environment for JAFNPP is not aggressive and concrete is designed in accordance with specification ACI 318-63, Building Code Requirements for Reinforced Concrete, which results in low permeability and resistance to aggressive chemical solutions by providing a high cement, low water/cement ratio (0.50 or less), proper curing and adequate air content (between 3% and 5%). Although specified water/ cement ratio's fall outside the established range of 0.35 to 0.45, given all remaining parameters for durable concrete mix design JAFNPP concrete meets the quality requirements of ACI to ensure acceptable concrete is obtained. Therefore, cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not aging effects requiring management for JAFNPP Groups 1-5, 7, 9 structures.

2. Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling) Due to Aggressive Chemical Attack for Groups 1-5, 7, 9 Structures

   Aggressive chemical attack becomes significant to concrete exposed to an aggressive environment. Resistance to mild acid attack is enhanced by using a dense concrete with low permeability and low water-to-cement ratio of less than 0.50. These groups of structures at JAFNPP 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. JAFNPP concrete is constructed in accordance with the recommendations in ACI 201.2R-77 for durability.

JAFNPP below-grade environment is not aggressive. Therefore, increase in porosity and permeability cracking, loss of material (spalling, scaling) due to aggressive chemical attack are not aging effects requiring management for JAFNPP Groups 1-5, 7, 9 concrete structures.

3. Loss of Material Due to Corrosion for Groups 1-5, 7, 8 Structures

   JAFNPP Structures Monitoring Program will be used to manage aging effect requiring management for JAFNPP Groups 1-5, 7, 8 structures.

4. Loss of Material (Spalling, Scaling) and Cracking Due to Freeze-Thaw for Groups 1-3, 5, 7-9 Structures

   Aggregates were in accordance with specifications and materials conforming to ACI and ASTM standards. JAFNPP structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318 63, and air entrainment percentages were within the range prescribed in NUREG-1801. Therefore, loss of material (spalling, scaling) and cracking due to freeze thaw are not aging effects requiring management for JAFNPP Groups 1-3, 5, 7-9 structures.

5. Cracking Due to Expansion and Reaction with Aggregates 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, which are in accordance with the recommendations in ACI 201.2R-77 for concrete durability. JAFNPP structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318-63, and air entrainment percentages were within the range prescribed in NUREG-1801. Therefore, cracking due to expansion and reaction with aggregates for Groups 1-5, 7-9 structures is not an aging effect requiring management.

6. Cracks and Distortion Due to Increased Stress Levels from Settlement for Groups 1-3, 5-9 Structures

   For Groups 1-3, 5-9 structures at JAFNPP, settlement is not a credible event since structures are founded on bedrock. Therefore, cracks and distortion due to increased stress levels from settlement for Groups 1-3, 5-9 structures is not an aging effect requiring management for JAFNPP concrete.

7. Reduction in Foundation Strength, Cracking, Differential Settlement Due to Erosion of Porous Concrete Subfoundation for Groups 1-3, 5-9 Structures

   JAFNPP concrete was provided in accordance with ACI 318-63 requirements resulting in dense, well-cured, high-strength concrete with low-permeability. Structures are supported on bedrock and erosion of the subfoundation is not credible since the subfoundation is also eliminating the possibility of loss of soil resulting in voids below the subgrade. Fluid leakage across the subfoundation is captured by circumferential drains and inspected for any material loss. Operating history has not identified any losses to date and, therefore, reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation are not aging effects requiring management for JAFNPP Groups 1-3, 5-9 structures.

8. Lock Up Due to Wear for Lubrite® Radial Beam Seats in BWR Drywell and Other Sliding Support Surfaces

   Owing to the wear-resistant material used, the low frequency (number of times) of movement, and the slow movement between sliding surfaces, lock-up due to wear is not an aging effect requiring management at JAFNPP. However, Lubrite® plates are included within the Structures Monitoring Program and ISI-IWF Programs to confirm the absence of aging effects requiring management for this component.

3.5.2.2.2.2 Aging Management of Inaccessible Areas

JAFNPP concrete for Group 1-3, 5 and 7-9 inaccessible concrete areas was provided in accordance with specification ACI 318-63, Building Code Requirements for Reinforced Concrete, which requires the following, resulting in low permeability and resistance to aggressive chemical solution.

- high cement content
- low water permeability
- proper curing
- adequate air entrainment

JAFNPP concrete also meets requirements of later ACI guide ACI 201.2R-77, Guide to Durable Concrete, since both documents use the same ASTM standards for selection, application and testing of concrete.

Inspections of accessible concrete have not revealed degradation related to corrosion of embedded steel. JAFNPP below-grade environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1,500 ppm). Therefore, corrosion of embedded steel is not an aging effect requiring management for JAFNPP concrete.

3.5.2.2.2.3 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.

Group 1-5 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 for JAFNPP.

3.5.2.2.2.4 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. Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)/Aggressive Chemical Attack; and Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)/Corrosion of Embedded Steel in Below-Grade Inaccessible Concrete Areas of Group 6 Structures

   Below-grade exterior reinforced concrete at JAFNPP 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, cracking, loss of material (spalling, scaling)/ aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling)/ corrosion of embedded steel are not aging effects requiring management for below-grade inaccessible concrete areas of JAFNPP Group 6 structures.

2. 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. JAFNPP structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318, and air entrainment percentages were within the range prescribed in NUREG-1801. Therefore, loss of material (spalling, scaling) and cracking due to freeze thaw are not aging effects requiring management for JAFNPP Groups 6 structures.

3. Cracking Due to Expansion and Reaction with Aggregates, Increase in Porosity and Permeability, and Loss of Strength Due to Leaching of Calcium Hydroxide 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, which are in accordance with the recommendations in ACI 201.2R-77 for concrete durability. JAFNPP structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318-63, and air entrainment percentages were within the range prescribed in NUREG-1801. JAFNPP 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, increase in porosity and permeability due to leaching of calcium hydroxide in below grade inaccessible concrete areas of Group 6 Structures is not an aging effect requiring management for JAFNPP concrete.

3.5.2.2.2.5 Cracking due to Stress Corrosion Cracking and Loss of Material due to Pitting and Crevice Corrosion

No tanks with stainless steel liners are included in the structural aging management reviews. Tanks subject to aging management review are evaluated with their respective mechanical systems.

3.5.2.2.2.6 Aging of Supports Not Covered by Structures Monitoring Program

NUREG-1801 recommends further evaluation of certain component support/aging effect combinations if they are not covered by the applicant's Structures Monitoring program. Component supports at JAFNPP are included in the Structures Monitoring Program for Groups B2 through B5 and Inservice Inspection (ISI-IWF) program for Group B1.

(1) Reduction in concrete anchor capacity due to degradation of the surrounding concrete for Groups B1 through B5 supports

   JAFNPP concrete anchors and surrounding concrete are included in the Structures Monitoring Program (Groups B2 through B5) and Inservice Inspection (IWF) Program (Group B1).

(2) Loss of material due to general and pitting corrosion, for Groups B2 through B5 supports

Loss of material due to corrosion of steel support components is an aging effect requiring management at JAFNPP. This aging effect is managed by the Structures Monitoring Program.

(3) Reduction/loss of isolation function due to degradation of vibration isolation elements for Group B4 supports

The JAFNPP aging management review did not identify any component support structure/aging effect combination corresponding to NUREG-1801 Volume 2 Item III.B4.2-a.

3.5.2.2.2.7 Cumulative Fatigue Damage due to Cyclic Loading

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 JAFNPP current licensing basis, no fatigue analyses were identified for component support members, anchor bolts, and welds 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 JAFNPP 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 drywell to torus vent system, torus shell, and torus penetrations. The fatigue analyses for the torus and torus penetrations 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, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
PWR Concrete (Reinforced and Prestressed) and Steel Containment BWR Concrete (Mark II and III) and Steel (Mark I, II, and III) Containment					
3.5.1-1	Concrete elements: walls, dome, basemat, ring girder, buttresses, containment (as applicable).	Aging of accessible and inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	ISI (IWL) and for inaccessible concrete, an examination of representative samples of below-grade concrete and periodic monitoring of groundwater if environment is nonaggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes, plant-specific, if the environment is aggressive	Not applicable. The listed concrete elements apply to PWR containments and concrete BWR containments. JAFNPP containment is a Mark I steel containment. See Section 3.5.2.2.1.1.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-2	Concrete elements; All	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. JAFNPP containment is a steel containment. Concrete elements are limited to floor slab and reactor vessel pedestal. These elements are not subject to the listed aging effect because they are founded on the reactor building base slab. See Section 3.5.2.2.1.2.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-3	Concrete elements: foundation, subfoundation	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program. If a dewatering system is relied upon to control erosion of cement from porous concrete subfoundations, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. JAFNPP containment is a Mark I steel containment. See Section 3.5.2.2.1.2.
3.5.1-4	Concrete elements: dome, wall, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable)	Reduction of strength and modulus due to elevated temperature	A plant-specific aging management program is to be evaluated	Yes, plant-specific if temperature limits are exceeded	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. JAFNPP is a Mark I steel containment. See Section 3.5.2.2.1.3.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-5	Steel elements: Drywell; torus; drywell head; embedded shell and sand pocket regions; drywell support skirt; torus ring girder; downcomers; liner plate, ECCS suction header, support skirt, region shielded by diaphragm floor, suppression chamber (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 significant for inaccessible areas	Containment Inservice Inspection (CII) and Containment Leak Rate Program will manage this aging effect. Containment inservice inspection is a plant-specific program for JAFNPP. Corrosion is not significant for inaccessible areas (i.e., drywell steel shell). To prevent corrosion of the lower part of the drywell, the interior and exterior surfaces are protected from contact with the atmosphere by complete concrete encasement. Concrete is designed in accordance with ACI standards and monitored under the Structures Monitoring Program. The drywell steel shell and the moisture barrier where the drywell shell becomes embedded in the drywell concrete floor are inspected in accordance with the (continued)

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					Containment Inservice Inspection (IWE) Program and Structures Monitoring Program. See Section 3.5.2.2.1.4.
3.5.1-6	Steel elements: steel liner, liner anchors, integral attachments	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	Yes, if corrosion is significant for inaccessible areas	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. JAFNPP containment is a Mark I steel containment. See Section 3.5.2.2.1.4.
3.5.1-7	Prestressed containment tendons	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. This is applicable only to PWR and BWR prestressed concrete containments. JAFNPP containment is a Mark I steel containment. See Section 3.5.2.2.1.5.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-8	Steel and stainless steel elements: vent line, vent header, vent line bellows; downcomers	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue analysis is a TLAA for the torus shell. Fatigue of the torus to drywell vent system is event driven and the analysis is not a TLAA. See Section 3.5.2.2.1.6.
3.5.1-9	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue analysis is a TLAA for the torus penetrations. See Section 3.5.2.2.1.6.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-10	Stainless steel penetration sleeves, penetration bellows, dissimilar metal welds	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J and additional appropriate examinations/ evaluations for bellows assemblies and dissimilar metal welds	Yes, detection of aging effects is to be evaluated	Cracking due to SCC is not an applicable aging mechanism for these primary containment components at JAFNPP. See Section 3.5.2.2.1.7 for further discussion. Nonetheless, components are included in the Containment Inservice Inspection (CII) 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 includes augmented ultrasonic exams to detect fine cracks.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-11	Stainless steel vent line bellows	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examination/ evaluation for bellows assemblies and dissimilar metal welds	Yes, detection of aging effects is to be evaluated	Cracking due to SCC is not an applicable aging mechanism for stainless steel vent line bellows at JAFNPP. See Section 3.5.2.2.1.7 for further discussion. Nonetheless, components are included in the Containment Inservice Inspection (CII) 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 Program includes augmented ultrasonic exams to detect fine cracks.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-12	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cracking due to cyclic loading	ISI (IWE) and 10 CFR Part 50, Appendix J supplemented to detect fine cracks	Yes, detection of aging effects is to be evaluated	Containment Inservice Inspection (CII) and Containment Leak Rate Programs will manage this aging effect. The Containment Inservice Inspection Program includes augmented ultrasonic exams to detect fine cracks. See Section 3.5.2.2.1.8.
3.5.1-13	Steel, stainless steel elements, dissimilar metal welds: torus; vent line; vent header; vent line bellows; downcomers	Cracking due to cyclic loading	ISI (IWE) and 10 CFR Part 50, Appendix J supplemented to detect fine cracks	Yes, detection of aging effects is to be evaluated	Containment Inservice Inspection (CII) and Containment Leak Rate Programs will manage this aging effect. The Containment Inservice Inspection Program includes augmented ultrasonic exams to detect fine cracks. See Section 3.5.2.2.1.8.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-14	Concrete elements: dome, wall, basemat ring girder, buttresses, containment (as applicable)	Loss of material (Scaling, cracking, and spalling) due to freeze-thaw	ISI (IWL) Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for plants located in moderate to severe weathering conditions	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. JAFNPP containment is a Mark I steel containment. See Section 3.5.2.2.1.9.
3.5.1-15	Concrete elements: walls, dome, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable).	Cracking due to expansion and reaction with aggregate; increase in porosity, permeability due to leaching of calcium hydroxide	ISI (IWL) for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. JAFNPP containment is a Mark I steel containment. See Section 3.5.2.2.1.10.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-16	Seals, gaskets, and moisture barriers	Loss of sealing and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	ISI (IWE) and 10 CFR Part 50, Appendix J	No	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. For JAFNPP, the Containment Leak Rate, Structures Monitoring and Periodic Surveillance and Preventive Maintenance programs manages cracking and change in material properties. Seals and gaskets are not included in the Containment Inservice Inspection Program at JAFNPP.
3.5.1-17	Personnel airlock, equipment hatch and CRD hatch locks, hinges, and closure mechanisms	Loss of leak tightness in closed position due to mechanical wear of locks, hinges and closure mechanisms	10 CFR Part 50, Appendix J and Plant Technical Specifications	No	Locks, hinges, and closure mechanisms are active components and are therefore not subject to aging management review. 10 CFR Part 50, Appendix J, and JAFNPP technical specifications require testing to ensure leak tightness of airlocks and hatches.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-18	Steel penetration sleeves and dissimilar metal welds; personnel airlock, equipment hatch and CRD hatch	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Containment Inservice Inspection (CII) and Containment Leak Rate Programs will manage this aging effect. Containment inservice inspection is a plant-specific program for JAFNPP.
3.5.1-19	Steel elements: stainless steel suppression chamber shell (inner surface)	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable. This is applicable to stainless steel suppression chambers. The JAFNPP suppression chamber is carbon steel.
3.5.1-20	Steel elements: suppression chamber liner (interior surface)	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. JAFNPP containment is a Mark I steel containment.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-21	Steel elements: drywell head and downcomer pipes	Fretting or lock up due to mechanical wear	ISI (IWE)	No	Loss of material is the aging effect caused by mechanical wear. JAFNPP plant operating experience has not identified fretting or lock up due to mechanical wear for the drywell head and downcomers. JAFNPP inspects the drywell head and downcomers per the requirements of ASME Section XI. In addition, the drywell head is a stationary or fixed component and the downcomers are stationary, well-braced components and the special distance between connecting components makes it unlikely for fretting and lock up to occur.
3.5.1-22	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion	ISI (IWL)	No	Not applicable. JAFNPP containment is a Mark I steel containment without prestressed tendons.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
Safety-Related and Other Structures; and Component Supports					
3.5.1-23	All Groups except Group 6: interior and above grade exterior concrete	Cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Corrosion of embedded steel becomes significant if exposed to an aggressive environment. Corrosion is not significant if the concrete has a low water-to-cement ratio, low permeability, and is designed in accordance with ACI Standards (ACI-318 or ACI-349). Loss of bond is included with cracking for the purpose of this review. The design and construction of these structures at JAFNPP prevents corrosion of embedded steel. See Section 3.5.2.2.2.1 Item 1 for further discussion. Nonetheless, components are included in the Structures Monitoring Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-24	All Groups except Group 6: interior and above grade exterior concrete	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Listed aging effects do not require management at JAFNPP. See Section 3.5.2.2.2.1 Item 2 for further discussion. Nonetheless, components are included in the Structures Monitoring Program.
3.5.1-25	All Groups except Group 6: steel components: all structural steel	Loss of material due to corrosion	Structures Monitoring Program. If protective coatings are relied upon to manage the effects of aging, the structures monitoring program is to include provisions to address protective coating monitoring and maintenance.	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. Structures Monitoring Program manages loss of material. Protective coatings are not relied upon to manage the effects of aging. In some cases Periodic Surveillance and Preventive Maintenance and Fire Protection Programs supplement the Structures Monitoring Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-26	All Groups except Group 6: accessible and inaccessible concrete: foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Structures Monitoring Program. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, if not within the scope of the applicant's structures monitoring program or for plants located in moderate to severe weathering conditions	Freeze-thaw is not an applicable aging mechanism for these groups of structures at JAFNPP. See Section 3.5.2.2.2.1 Item 4 for further discussion. Nonetheless, components are included in the Structures Monitoring Program.
3.5.1-27	All Groups except Group 6: accessible and inaccessible interior/exterior concrete	Cracking due to expansion due to reaction with aggregates	Structures Monitoring Program None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if not within the scope of the applicant's structures monitoring program or concrete was not constructed as stated for inaccessible areas	Reaction with aggregates is not an applicable aging mechanism for concrete for these groups of structures at JAFNPP. See Section 3.5.2.2.2.1 Item 5 for further discussion. Nonetheless, components are included in the Structures Monitoring Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-28	Groups 1-3, 5-9: all	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	JAFNPP structures are founded on bedrock. Plant operating experience has not identified settlement of structures resulting in cracks and distortion of component structures; therefore, cracks and distortion are not aging effects requiring management. See discussion in Section 3.5.2.2.2.1 Item 6.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-29	Groups 1-3, 5-9: foundation	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	JAFNPP structures are founded on bedrock. Plant operating experience has not identified settlement of structures resulting is cracks and distortion of component structures; therefore, the listed aging effects do not require management. See discussion in Section 3.5.2.2.2.1 Item 7.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-30	Group 4: Radial beam seats in BWR drywell; RPV support shoes for PWR with nozzle supports; Steam generator supports	Lock-up due to wear	ISI (IWF) or Structures Monitoring Program	Yes, if not within the scope of ISI or structures monitoring program	Lubrite plates are used in the drywell beam seats at JAFNPP. Lubrite materials for nuclear applications are designed to resist deformation, have a low coefficient of friction, resist softening at elevated temperatures, resist corrosion, withstand high intensities of radiation, and will not score or mar; therefore, they are not susceptible to aging effects requiring management. Nonetheless, lubrite components associated with the drywell beam seats are included in the Structures Monitoring Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-31	Groups 1-3, 5, 7-9: below-grade concrete components, such as exterior walls below grade and foundation	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack; Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures monitoring Program; Examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes, plant-specific, if environment is aggressive	JAFNPP concrete has a low water-to-cement ratio, low permeability, and designed in accordance with ACI Standards (ACI-318 or ACI-349). The design and construction of these groups of structures at JAFNPP prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Loss of bond is included with cracking for the purpose of this review. Aging effects are not significant for accessible and inaccessible below-grade areas. See discussion in Section 3.5.2.2.2.1 Item 2.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-32	Groups 1-3, 5, 7-9: exterior above and below grade reinforced concrete foundations	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	JAFNPP concrete has a low water-to-cement ratio, low permeability, and is designed in accordance with ACI Standards (ACI-318 or ACI-349). The design and construction of these groups of structures at JAFNPP prevents the effect of this aging from occurring; therefore, this aging effect does not require management. See Section 3.5.2.2.2.1 Item 2. Nonetheless, components are included in the Structures Monitoring Program.
3.5.1-33	Groups 1-5: concrete	Reduction of strength and modulus due to elevated temperature	Plant-specific	Yes, plant-specific if temperature limits are exceeded	JAFNPP concrete elements do not exceed specified temperature limits. See discussion in Section 3.5.2.2.2.3.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-34	Group 6: Concrete; all	Increase in porosity and permeability, cracking, loss of material due to aggressive chemical attack; Cracking, loss of bond, loss of material due to corrosion of embedded steel	Insp of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs, and for inaccessible concrete, exam of rep. samples of below-grade concrete, and periodic monitoring of groundwater, if environment is non-aggressive. Plant specific if environment is aggressive.	Yes, plant-specific if environment is aggressive	The listed aging effects are not significant for accessible and inaccessible areas because JAFNPP ground water is non-aggressive. Loss of bond is included with cracking for the purpose of this review. The Structures Monitoring Program will confirm the absence of aging effects requiring management for JAFNPP Group 6 components exposed to a fluid environment. See Section 3.5.2.2.2.4 Item 1.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-35	Group 6: exterior above and below grade concrete foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for plants located in moderate to severe weathering conditions	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 JAFNPP is designed with entrained air content of between 3% and 5% in conformance with ACI-318, and plant experience has not identified any degradation related to freeze-thaw. Nonetheless, the Structures Monitoring Program will confirm the absence of aging effects requiring management for JAFNPP Group 6 concrete components. See Section 3.5.2.2.2.4 Item 2 for additional discussion.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-36	Group 6: all accessible/ inaccessible reinforced concrete	Cracking due to expansion/ reaction with aggregates	Accessible areas: Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Reaction with aggregates is not an applicable aging mechanism for JAFNPP concrete components. See Section 3.5.2.2.2.1 Item 5 (although for Groups 1-5, 7, 9 this discussion is also applicable for Group 6). See Section 3.5.2.2.2.4 Item 3 for additional discussion. Nonetheless, the Structures Monitoring Program will confirm the absence of aging effects requiring management for JAFNPP Group 6 concrete components.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-37	Group 6: exterior above and below grade reinforced concrete foundation interior slab	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide	For accessible areas, Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Not applicable. Nonetheless the Structures Monitoring Program will confirm the absence of aging effects requiring management for JAFNPP Group 6 concrete components. See Section 3.5.2.2.2.4 Item 3.
3.5.1-38	Groups 7, 8: Tank liners	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Plant-specific	Yes, plant specific	There are no concrete or steel tanks with stainless steel liners in the scope of JAFNPP license renewal.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-39	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	The Structures Monitoring Program will manage aging effects identified by this line item. In some cases the Fire Protection Program or Fire Water System Program supplements the Structures Monitoring Program.
3.5.1-40	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	JAFNPP concrete components are designed in accordance with accepted ACI standards. Plant experience has not identified reduction in concrete anchor capacity or other concrete aging mechanisms. Nonetheless, the Structures Monitoring Program will confirm absence of aging effects requiring management for JAFNPP concrete components. See Section 3.5.2.2.2.6 Item 1 for additional discussion.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-41	Vibration isolation elements	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	No vibration isolation elements at JAFNPP are in scope and subject to aging management review.
3.5.1-42	Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Not applicable. No CLB fatigue analysis exists.
3.5.1-43	Groups 1-3, 5, 6: all masonry block walls	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Wall Program	No	Consistent with NUREG-1801 for masonry walls within the station. The Masonry Wall Program manages this aging effect. In some cases Fire Protection Program supplements the Masonry Wall Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-44	Group 6 elastomer seals, gaskets, and moisture barriers	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	No	Loss of sealing is a consequence of elastomer cracking and change in material properties. Component types include compressible joints and seals and gaskets. The Structures Monitoring Program manages cracking and change in material properties.
3.5.1-45	Group 6: exterior above and below grade concrete foundation; interior slab	Loss of material due to abrasion, cavitation	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance	No	Abrasion and cavitation due to flowing water are insignificant at JAFNPP due to the low flow velocities for these structures. Nonetheless, the Structures Monitoring Program will confirm absence of aging effects requiring management for JAFNPP Group 6 concrete components.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-46	Group 5: Fuel pool liners	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Water Chemistry and Monitoring of spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channel.	No	At JAFNPP, the Water Chemistry Control 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 chase 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).

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-47	Group 6: all metal structural members	Loss of material due to general (steel only), pitting and crevice corrosion	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. If protective coatings are relied upon to manage aging, protective coating monitoring and maintenance provisions should be included.	No	The listed aging management program is not used. The Structures Monitoring Program will confirm absence of aging effects requiring management for JAFNPP Group 6 steel components. In some cases Fire Protection Program supplements the Structures Monitoring Program.
3.5.1-48	Group 6: earthen water control structures - dams, embankments, reservoirs, channels, canals, and ponds	Loss of material, loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs.	No	Not applicable. JAFNPP does not have earthen water control structures.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-49	Support members; welds; bolted connections; support anchorage to building structure	Loss of material/ general, pitting, and crevice corrosion	Water Chemistry and ISI (IWF)	No	JAFNPP Water Chemistry Control and ISI-IWF Programs manage this aging effect.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-50	Groups B2, and B4: galvanized steel, aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion	Structures Monitoring Program	No	Consistent with NUREG-1801 for galvanized steel components in outdoor air. The Structures Monitoring Program will manage loss of material. Loss of material is not an applicable aging effect for stainless steel or aluminum components in outdoor air. The ambient environment at JAFNPP is not chemically polluted by vapors of sulfur dioxide or other similar substances and the external environment does not contain saltwater or high chlorides. Therefore, loss of material due to pitting and crevice corrosion is not an aging effect requiring management for aluminum and stainless steel components exposed to the external environment.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-51	Group B1.1: high strength low-alloy bolts	Cracking due to stress corrosion cracking; loss of material due to general corrosion	Bolting Integrity	No	SCC of high strength anchor bolts is not an aging effect requiring management at JAFNPP for two reasons. (1) JAFNPP does not utilize high strength bolting in structural applications; the bolting used is not exposed to a corrosive environment or high tensile stresses. (2) Bolting connections are installed with friction-type contact surfaces via the turn-of-the-nut method; therefore, for bolts greater than 1" in diameter, a significant preload (in the order of 70% of ultimate strength) is not practical to develop. The JAFNPP ISI-IWF Program manages loss of material for bolting connections.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-52	Groups B2, and B4: sliding support bearing and sliding support surfaces	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	Structures Monitoring Program	No	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 cyclic thermal loads are rare for structural supports due to their relatively low temperatures.
3.5.1-53	Groups B1.1, B1.2, and B1.3: support members: welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	ISI (IWF)	No	JAFNPP ISI-IWF Program manages this aging effect.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-54	Groups B1.1, B1.2, and B1.3: Constant and variable load spring hangers; guides; stops	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	Loss of mechanical function due to the listed mechanisms is not an aging effect. 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 3.5.1-53 for Groups B1.1, B1.2, and B1.3 support members.
3.5.1-55	PWR only				

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-56	Groups B1.1, B1.2, and B1.3: Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	Lubrite plates are used in the torus support saddles at JAFNPP. Lubrite materials for nuclear applications are designed to resist deformation, have a low coefficient of friction, resist softening at elevated temperatures, resist corrosion, withstand high intensities of radiation, and will not score or mar; therefore, they are not susceptible to aging effects requiring management. Nonetheless, lubrite components associated with the torus supports are included in the JAFNPP ISI-IWF Program.
3.5.1-57	Groups B1.1, B1.2, and B1.3: Vibration isolation elements	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	ISI (IWF)	No	No supports with vibration isolation elements have been identified in the scope of license renewal for JAFNPP.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-58	Galvanized steel and aluminum support members; welds; bolted connections; support anchorage to building structure exposed to air - indoor uncontrolled	None	None	None NA - No AEM or AMP	Consistent with NUREG 1801.
3.5.1-59	Stainless steel support members; welds; bolted connections; support anchorage to building structure	None	None	NA - No AEM or AMP	Consistent with NUREG 1801.

Notes for Table 3.5.2-1 through 3.5.2-4

Generic Notes

A. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP 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 JAFNPP 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 JAFNPP.

503. The ambient environment at JAFNPP is not chemically polluted by vapors of sulfur dioxide or other similar substances 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.

Table 3.5.2-1
Reactor Building and Primary Containment
Summary of Aging Management Evaluation

3.5.2-1: Reactor Building and Primary Containment								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Battery racks A and B, steel framing	EN, SSR	Carbon steel	Protected from weather	Loss of material	Periodic Surveillance and Preventive Maintenance	III.A1-12 (T-11)	3.5.1-25	E
CRD removal hatch	EN, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-6 (C-16)	3.5.1-18	E
Drywell equipment hatch	EN, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-6 (C-16)	3.5.1-18	E
Drywell head manway cover	EN, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Drywell personnel access lock	EN, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-6 (C-16)	3.5.1-18	E
Drywell personnel escape lock	EN, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-6 (C-16)	3.5.1-18	E

3.5.2-1: Reactor Building and Primary Containment

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Drywell shell	EN, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Drywell shell protection panels (jet deflectors)	MB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	C
Drywell stabilizer supports	SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	C
Drywell to torus vent line bellows	PB, SSR	Stainless steel	Protected from weather	Cracking	CII-IWE Containment Leak Rate	II.B1.1-5 (C-22)	3.5.1-11	E
Drywell to torus vent system	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Drywell to torus vent system	PB, SSR	Carbon steel	Exposed to fluid environment	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E

3.5.2-1: Reactor Building and Primary Containment

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Equipment access lock doors	EN, FB, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring Periodic Surveillance and Preventive Maintenance Fire Protection	III.A1-12 (T-11)	3.5.1-25	E
Flood bulkhead wall	EN, FLB	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 (T-11)	3.5.1-25	C
Inner refueling bellows	PB,SSR	Stainless steel	Exposed to fluid environment	Cracking – cyclic loading	CII-IWE Containment Leak Rate	II.B1.1-3 (C-20)	3.5.1-13	C
Inner refueling bellows	PB,SSR	Stainless steel	Exposed to fluid environment	Loss of material	CII-IWE Containment Leak Rate			H
Metal siding	FB, PB	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	A
Metal siding	FB, PB	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring	III.B4-7 (TP-6)	3.5.1-50	C
New fuel storage racks	EN, SSR	Aluminum	Protected from weather	None	None	III.B5-2 (TP-8)	3.5.1-58	A

3.5.2-1: Reactor Building and Primary Containment								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Primary containment electrical penetrations	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-1 (C-12)	3.5.1-18	E
Primary containment (drywell) mechanical penetrations (includes those w/ bellows)	PB, SSR	Carbon steel	Protected from weather	Cracking – cyclic loading	CII-IWE Containment Leak Rate	II.B4-3 (C-14)	3.5.1-12	E
Primary containment (drywell) mechanical penetrations (includes those w/ bellows)	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-1 (C-12)	3.5.1-18	E
Primary shield wall lateral supports	EN, MB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A
Primary shield wall (steel portion)	EN, MB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A

3.5.2-1: Reactor Building and Primary Containment								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Reactor building crane, rails and girders	SNS	Carbon steel	Protected from weather	Loss of material	Periodic Surveillance and Preventive Maintenance	VII B-3 (A-07)	3.3.1-73	E
Reactor vessel stabilizer assembly	SSR	Carbon steel	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Reactor vessel support assembly	SSR	Carbon steel	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Refueling bridge equipment assembly	SNS	Carbon steel	Protected from weather	Loss of material	Periodic Surveillance and Preventive Maintenance	VII B-3 (A-07)	3.3.1-73	E
Spent fuel pool liner plate and gate	EN, SSR	Stainless steel	Exposed to fluid environments	Loss of material	Water Chemistry Control – BWR Monitoring of spent fuel pool level per Tech Spec and monitoring leakage from leak chase channel	III.A5-13 (T-14)	3.5.1-46	A
Spent fuel pool storage racks	SSR	Aluminum	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR			F
Spent fuel pool storage racks	SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C

3.5.2-1: Reactor Building and Primary Containment

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Structural steel: beams, columns and plates	EN, FB, MB, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	C
					Fire Protection	III.A1-12 (T-11)	3.5.1-25	C
Torus electrical penetrations	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-1 (C-12)	3.5.1-18	E
Torus external supports (saddles, columns)	SSR	Carbon steel	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Torus manway cover	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Torus mechanical penetrations	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-1 (C-12)	3.5.1-18	E
Torus mechanical penetrations	PB, SSR	Carbon steel	Protected from weather	Cracking – fatigue	TLAA – metal fatigue	II.B4-4 (C-13)	3.5.1-9	A
Torus ring girder	SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E

3.5.2-1: Reactor Building and Primary Containment								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Torus ring girder	SSR	Carbon steel	Exposed to fluid environment	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Torus shell	HS, PB, SSR	Carbon steel	Protected from weather	Cracking – fatigue	TLAA – metal fatigue	II.B1.1-4 (C-21)	3.5.1-8	A
Torus shell	HS, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Torus shell	HS, PB, SSR	Carbon steel	Exposed to fluid environment	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Torus thermowells	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Vent header support	SSR	Carbon steel	Exposed to fluid environment	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Beams, columns, floor slabs, and interior walls	EN, FB, FLB, MB, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501
Biological shield wall	EN, MB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501

3.5.2-1: Reactor Building and Primary Containment								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Drywell fill slab	SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Drywell sump	SSR	Concrete	Exposed to fluid environment	None	Structures Monitoring			I, 501
Exterior walls above and below grade	SSR, FB, PB, MB,FLB	Concrete	Exposed to weather	None	Structures Monitoring Fire Protection			I, 501
Foundation	PB, SSR, FLB	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Masonry walls	SSR, EN, FB, MB, SNS	Concrete block	Protected from weather	Cracking	Masonry Wall Fire Protection	III.A1-11 (T-12)	3.5.1-43	A
Masonry walls	SSR, EN, FB, MB, SNS	Concrete block	Exposed to weather	Cracking	Masonry Wall Fire Protection	III.A1-11 (T-12)	3.5.1-43	A
New fuel storage vault	EN, SNS, MB	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Primary shield wall (concrete portion)	EN, MB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Reactor building sump structure	SSR	Concrete	Exposed to fluid environment	None	Structures Monitoring			I, 501

3.5.2-1: Reactor Building and Primary Containment

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Reactor pedestal	SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Spent fuel pool wall and floor slab	EN, MB, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Moisture barrier	EN, SSR	Elastomer	Protected from weather	Cracking Change in material properties	Structures Monitoring	II.B4-7 (C-18)	3.5.1-16	E
Primary containment electrical penetration seals and sealant	PB, SSR	Elastomer	Protected from weather	Cracking Change in material properties	Containment Leak Rate	II.B4-7 (C-18)	3.5.1-16	E
Rubber seal for equipment lock doors	SSR, PB	Rubber	Protected from weather	Cracking Change in material properties	Periodic Surveillance and Preventive Maintenance	II B4-7 (C-18)	3.5.1-16	E
Lubrite sliding supports	SSR	Lubrite	Protected from weather	None	ISI-IWF Structures Monitoring			I, 501

Table 3.5.2-2
Water Control Structures
Summary of Aging Management Evaluation

3.5.2-2: Water Control Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Crane rails and girders	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	VII.B-3 (A-07)	3.3.1-73	E
Metal roof decking	SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	A
Metal siding	EN, SRE	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring	III.B4-7 (TP-6)	3.5.1-50	C
Structural steel: beams, columns and plates	EN, FB, SNS, SSR	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	A
Structural steel: beams, columns and plates	EN, FB, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring Fire Protection	III.A6-11 (T-21)	3.5.1-47	E
Structural steel: beams, columns and plates	EN, SNS, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Structural steel: beams, columns and plates	EN, FB, SNS, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring Fire Protection	III.A6-11 (T-21)	3.5.1-47	E

3.5.2-2: Water Control Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Structural steel: beams, columns and plates	EN, SNS, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Structures Monitoring			F
Beams, columns, floor slabs and walls (above grade)	FB, FLB, HS, MB, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501
Beams, columns, floor slabs and walls (below grade)	FLB, HS, SNS, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6.7 (T-20)	3.5.1-45	E
Exterior walls above grade	FB, FLB, MB, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring Fire Protection			I, 501
Exterior walls below grade	FLB, HS, SNS, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6.7 (T-20)	3.5.1-45	E
Intake and discharge tunnels	FLB, HS, SNS, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6.7 (T-20)	3.5.1-45	E
Foundation	EN, MB, SNS, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring Fire Protection	III.A6.7 (T-20)	3.5.1-45	E
Masonry wall	EN, FB, SRE	Concrete block	Protected from weather	Cracking	Masonry Wall	III.A6-10 (T-12)	3.5.1-43	A

3.5.2-2: Water Control Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Fire pump room roof slab	FB, SNS, SRE	Concrete	Protected from weather	None	Structures Monitoring			I, 501

Table 3.5.2-3
Turbine Building Complex and Yard Structures
Summary of Aging Management Evaluation

3.5.2-3: Turbine Building Complex and Yard Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Control room ceiling support system	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 (T-11)	3.5.1-25	A
Crane rails and girders	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	VII.B-3 (A-07)	3.3.1-73	E
Metal siding	EN, FB, SRE	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring	III.B4-7 (TP-6)	3.5.1-50	C
Roof decking	FB, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring Fire Protection	III.A3-12 (T-11)	3.5.1-25	A
Structural steel: beams, columns, plates	MB, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	A
Structural steel: beams, columns, plates	EN, MB, SRE, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	A
Transmission tower	SRE	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring	III.B4-7 (TP-6)	3.5.1-50	C

3.5.2-3: Turbine Building Complex and Yard Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
CST wall below grade	EN, MB, SNS	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Duct banks	EN	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Exterior walls	EN, FB, MB, PB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Exterior walls	EN, FB, MB, PB, SNS, SRE, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Floor slabs, interior walls, and ceilings	EN, FB, MB, PB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501
Foundations	EN, SRE, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Manholes	EN	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Masonry walls	EN, FB, SNS, SRE, SSR	Concrete block	Protected from weather	Cracking	Masonry Wall Fire Protection	III.A1-11 III.A3-11 (T-12)	3.5.1-43	E

3.5.2-3: Turbine Building Complex and Yard Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Masonry walls	EN, FB, SNS	Concrete block	Exposed to weather	Cracking	Masonry Wall Fire Protection	III.A1-11 III.A3-11 (T-12)	3.5.1-43	E
Roof slabs	EN, FB, MB, PB, SNS, SRE, SSR	Concrete	Exposed to weather	None	Structures Monitoring Fire Protection			I, 501
Shield wall	EN, SNS	Concrete	Protected from weather	None	Structures Monitoring			I, 501

Table 3.5.2-4
Bulk Commodities
Summary of Aging Management Evaluation

3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Anchorage / embedments	SSR, SNS, SRE	Carbon steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E

3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Anchorage / embedments	SSR, SNS, SRE	Carbon steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR ISI-IWF	III.B1.1-11 (TP-10)	3.5.1-49	E
Anchorage / embedments	SSR, SNS, SRE	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR ISI-IWF	III.B1.1-11 (TP-10)	3.5.1-49	E
Base plates	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Base plates	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Base plates	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Base plates	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E

3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Battery racks	SSR, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B3-7 (T-30)	3.5.1-39	C
Cable tray	SSR, SNS, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	C
Cable tray	SSR, SNS, SRE	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Cable trays support	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
Cable trays support	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Component and piping supports for ASME Class 1, 2, 3 and MC	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Component and piping supports for ASME Class 1, 2, 3 and MC	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Component and piping supports for ASME Class 1, 2, 3 and MC	SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B1.1-9 III.B1.2-7 III.B1.3-7 (TP-5)	3.5.1-59	A

3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Component and piping supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Component and piping supports	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Conduits	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Conduits	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring	III.B2-7 (TP-6)	3.5.1-50	C
Conduit supports	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Conduit supports	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring	III.B2-7 (TP-6)	3.5.1-50	C
Conduit supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
Conduit supports	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A

3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Damper framing	FB	Carbon steel	Protected from weather	Loss of material	Fire Protection	III.B2-10 (T-30)	3.5.1-39	E
Electrical and instrument panels and enclosures	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B3-7 (T-30)	3.5.1-39	C
Electrical and instrument panels and enclosures	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.B3-7 (T-30)	3.5.1-39	C
Electrical and instrument panels and enclosures	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B3-3 (TP-11)	3.5.1-58	C
Electrical and instrument panels and enclosures	SSR, SNS, SRE	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring	III.B4-7 (TP-6)	3.5.1-50	C
Fire doors	FB	Carbon steel	Protected from weather	Loss of material	Fire Protection	VII.G-3 (A-21)	3.3.1-63	A
Fire hose reels	SRE	Carbon steel	Protected from weather	Loss of material	Fire Water System	III.B2-10 (T-30)	3.5.1-39	E
Flood, pressure and specialty doors	EN, FLB, MB, PB	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 III.A2-12 III.A3-12 (T-11)	3.5.1-25	C

3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Flood, pressure and specialty doors	EN, FLB, PB	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A1-12 III.A2-12 III.A3-12 (T-11)	3.5.1-25	C
HVAC duct supports	SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
HVAC duct supports	SNS, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Instrument line supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
Instrument line supports	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Instrument racks, frames and tubing trays	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B3-7 (T-30)	3.5.1-39	C
Instrument racks, frames and tubing trays	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Manways, hatches and hatch covers	EN, FLB, MB, PB, SRE, SSR, SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 III.A2-12 (T-11)	3.5.1-25	C
						III.A6-11 (T-21)	3.5.1-47	E

3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Manways, hatches and hatch covers	EN, FLB, MB, PB, SRE, SSR, SNS	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	C
						III.A6-11 (T-21)	3.5.1-47	E
Mirror insulation	INS, SNS	Stainless steel	Protected from weather	None	None	III.B1.3-7 (TP-5)	3.5.1-59	C, 502
Missile shields	EN, MB	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A
Monorails	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	VII.B-3 (A-07)	3.3.1-73	E
Penetration sleeves (mechanical/ electrical not penetrating PCS boundary)	SSR, SNS, FLB	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	C
Pipe whip restraints	SSR, SNS, EN	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A
Stairway, handrail, platform, decking, and ladders	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A

3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Stairway, handrail, platform, grating, decking, and ladders	SNS	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	A
Vents and louvers	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	C
Vents and louvers	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	C
Vents and louvers	SNS, SRE, SSR	Aluminum	Exposed to weather	None	None			I, 503
Anchor bolts	SNS, SRE, SSR	Carbon steel (bolted connections)	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Anchor bolts	SNS, SRE, SSR	Carbon steel (bolted connections)	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A

3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Anchor bolts	SSR, SNS, SRE	Carbon steel (bolted connections)	Exposed to weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Anchor bolts	SSR, SNS, SRE	Carbon steel (bolted connections)	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Anchor bolts	SSR, SNS, SRE	Stainless steel (bolted connections)	Protected from weather	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5 (TP-5)	3.5.1-59	A
Anchor bolts	SSR, SNS, SRE	Stainless steel (bolted connections)	Exposed to weather	None	None			I, 503
Anchor bolts	SSR, SNS, SRE	Galvanized steel (bolted connections)	Protected from weather	None	None	III.B2-5 III.B3-3 III.B4-5 III.B5-3 (TP-11)	3.5.1-58	A

3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Anchor bolts	SSR, SNS, SRE	Galvanized steel (bolted connections)	Exposed to weather	Loss of material	Structures Monitoring	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	A
ASME Class 1, 2, 3 and MC Supports bolting	SSR, SNS, SRE	Carbon steel (bolted connections)	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
ASME Class 1, 2, 3 and MC Supports bolting	SSR, SNS, SRE	Carbon steel (bolted connections)	Exposed to weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
ASME Class 1, 2, 3 and MC Supports bolting	SSR, SNS, SRE	Stainless steel (bolted connections)	Protected from weather	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5 (TP-5)	3.5.1-59	A
ASME Class 1, 2, 3 and MC Supports bolting	SSR, SNS, SRE	Stainless steel (bolted connections)	Exposed to weather	None	None			I, 503

3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Structural bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Structural bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Structural bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Structural bolting	SNS, SRE, SSR	Galvanized steel (bolted connections)	Protected from weather	None	None	III.B2-5 III.B3-3 III.B4-5 III.B5-3 (TP-11)	3.5.1-58	A
Structural bolting	SNS, SRE, SSR	Galvanized steel (bolted connections)	Exposed to weather	Loss of material	Structures Monitoring	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	A

3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Structural bolting	SNS, SRE, SSR	*Stainless steel (bolted connections)*	*Protected from weather*	*None*	*None*	III.B2-8 III.B3-5 III.B4-8 III.B5-5 (TP-5)	3.5.1-59	A
Structural bolting	SNS, SRE, SSR	Stainless steel (bolted connections)	Exposed to weather	None	None			I, 503
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Fire proofing	FB	Pyrocrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501
Flood curbs	FLB	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Manways, hatches and hatch covers	FB, FLB, PB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501

3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Manways, hatches and hatch covers	FB, FLB, PB, SNS, SRE, SSR	Concrete	Exposed to weather	None	Structures Monitoring Fire Protection			I, 501
Missile shields	MB	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Support pedestals	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Support pedestals	SNS, SRE, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Support pedestals	SNS, SRE, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III. A6-7 (T-20)	3.5.1-45	E
Fire stops	FB	Cera blanket	Protected from weather	Cracking/ delamination Separation	Fire Protection			J
Fire wrap	FB	Cerafiber, cera blanket	Protected from weather	Loss of material	Fire Protection			J
Insulation	INS, SNS	Fiberglass/ calcium silicate	Protected from weather	None	None			J, 502

3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Penetration sealant (fire)	EN, FB, PB, SNS	Elastomer	Protected from weather	Cracking Change in material properties	Fire Protection	VII G-1 (A-19)	3.3.1-61	A
Penetration sealant (flood, radiation)	EN, FLB, PB, SNS	Elastomer	Protected from weather	Cracking Change in material properties	Structures Monitoring	III.A6-12 (TP-7)	3.5.1-44	C
Seals and gaskets (doors, manways and hatches)	PB, SSR, FLB	Rubber	Protected from weather	Cracking Change in material properties	Structures Monitoring	II.B4-7 (C-18)	3.5.1-16	A
						III.A6-12 (TP-7)	3.5.1-44	E
Water stops	FLB	Rubber	Protected from weather	None	None			J

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.

- insulated cables and connections
- metal-enclosed bus
- transmission conductors
- switchyard bus
- high voltage insulators
- 115kV oil-filled cable system

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 3.0. 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 the system tables.

Materials

Electrical and I&C components subject to aging management review are constructed of the following materials.

- aluminum
- cement
- copper and copper alloys
- galvanized metals
- glass

- organic polymers
- porcelain
- steel and steel alloys
- stainless steel

Environment

Electrical and I&C components subject to aging management review are exposed to the following environments.

- heat and air
- moisture and voltage stress
- oil
- outdoor weather
- radiation and air

Aging Effects Requiring Management

The following aging effects associated with electrical and I&C components require management.

- elastomer degradation
- loss of material
- reduced insulation resistance
- thermal cycling and ohmic heating

Aging Management Programs

The following aging management programs will manage the effects of aging on electrical and I&C components.

- External Surfaces Monitoring
- Metal-Enclosed Bus Inspection
- Non-EQ Instrumentation Circuits Test Review
- Non-EQ Insulated Cables and Connections
- Oil Analysis

3.6.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 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 JAFNPP 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

Environmental qualification analysis are TLAAs as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed in Section 4.4.

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.

The insulators evaluated for JAFNPP license renewal are those used to support uninsulated, high-voltage electrical components such as transmission conductors and switchyard buses.

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. JAFNPP is not located near the seacoast or near other sources of airborne particles. Therefore, surface contamination is not an applicable aging effect for high-voltage insulators at JAFNPP.

Mechanical wear is an aging effect for strain and suspension insulators subject to movement. Although this mechanism 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 JAFNPP 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 JAFNPP, transmission conductors located between the switchyard breaker and reserve station service transformer T3 support recovery from an SBO event. Other transmission conductors are not subject to aging management review since they do not perform a license renewal intended function.

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. There is a set percentage of composite conductor strength established at which a transmission conductor is replaced. Corrosion rates depend largely on air quality. Corrosion of ACSR conductors is a very slow-acting aging effect that is even slower for rural areas with generally less suspended particles and SO2 concentrations in the air than urban areas.

Wind loading can cause transmission conductor vibration, or sway. Consideration of wind loading is during the design and installation phase. Loss of material that could be caused by transmission conductor vibration or sway are found not to be applicable aging effects in that they would not cause a loss of intended function if left unmanaged for the extended period of operation.

There are no applicable aging effects requiring management for JAFNPP transmission conductors.

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 located at the switchyard breakers and at reserve station service transformers T2 and T3 that support recovery from an SBO event are subject to aging management review. Other switchyard bus does not require aging management review since they do not perform a license renewal intended function.

Connection surface oxidation for aluminum switchyard bus is not applicable since switchyard bus connections requiring AMR are welded connections. For ambient environmental conditions at JAFNPP, no aging effects have been identified that could cause a loss of intended function for the period of extended operation. Vibration is not applicable since flexible connectors connect switchyard bus.

Therefore, there are no aging effects requiring management for JAFNPP switchyard bus.

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of JAFNPP quality assurance procedures and administrative controls for aging management programs.

3.6.2.3 Time-Limited Aging Analysis

The only TLAAs identified for the electrical and I&C commodity components are evaluations for environmental qualification (EQ). The EQ TLAA is evaluated in Section 4.4.

3.6.3 Conclusion

The electrical and I&C components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21(a)(1). The aging management programs selected to manage aging effects for the electrical and I&C components are identified in Section 3.6.2.1 and in the following tables. A description of aging management programs is provided in Appendix B of this application, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Based on the demonstrations provided in Appendix B, the effects of aging associated with electrical and I&C components will be managed such that there is reasonable assurance the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.6.1
Summary of Aging Management Programs for the Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1					
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	Degradation due to various aging mechanisms	Environmental qualification of electric components	Yes, TLAA	EQ equipment is not subject to aging management review because replacement is based on qualified life. EQ analyses are evaluated as TLAAs in Section 4.4.
3.6.1-2	Electrical cables, connections and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements	Reduced insulation resistance (IR) and electrical failure due to various physical, thermal, radiolytic, photolytic and chemical mechanisms	Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	No	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. JAFNPP electrical and I&C penetration assemblies are covered under the EQ Program.

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-3	Conductor insulation for electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance (IR)	Reduced insulation resistance (IR) and electrical failure due to various physical, thermal, radiolytic, photolytic and chemical mechanisms	Electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG-1801. Management of aging effects will be provided by the Non-EQ Instrumentation Circuits Test Review Program. This program includes review of calibration results or surveillance findings for instrumentation circuits.
3.6.1-4	Conductor insulation for inaccessible medium-voltage (2kV to 35kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	Localized damage and breakdown of insulation leading to electrical failure due to moisture intrusion, water trees	Inaccessible medium-voltage cables not subject to 10 CFR 50.49 EQ requirements	No	NUREG 1801 aging effects are not applicable to JAFNPP. A review of JAFNPP documents identified no inaccessible medium voltage cables requiring aging management.
3.6.1-5	PWR only				

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-6	Fuse holders (not part of a larger assembly) - metallic clamp	Fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	Fuse holders	No	NUREG 1801 aging effects are not applicable to JAFNPP. A review of JAFNPP documents indicated that fuse holders utilizing metallic clamps are either part of an active device or located in circuits that perform no intended function. Therefore, fuse holders with metallic clamps at JAFNPP are not subject to aging management review.
3.6.1-7	Metal enclosed bus – Bus / connections	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal Enclosed Bus	No	Consistent with NUREG-1801. The Metal-Enclosed Bus Inspection Program will manage the effects of aging. This program includes visual inspection of interior portions of the bus.

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-8	Metal enclosed bus – insulation / insulators	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure due to thermal/ thermoxidative degradation of organics / thermoplastics, radiation-induced oxidation; moisture/debris intrusion, and ohmic heating	Metal Enclosed Bus	No	Consistent with NUREG-1801. The Metal-Enclosed Bus Inspection Program will manage the effects of aging. This program includes visual inspection of interior portions of the bus.
3.6.1-9	Metal enclosed bus – enclosure assemblies	Loss of material due to general corrosion	Structures monitoring program	No	Not consistent with NUREG-1801. The Metal-Enclosed Bus Inspection Program will manage the effects of aging through visual inspection.
3.6.1-10	Metal enclosed bus – enclosure assemblies	Hardening and loss of strength / elastomers degradation	Structures monitoring program	No	Not consistent with NUREG-1801. The Metal-Enclosed Bus Inspection Program will manage the effects of aging through visual inspection.

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-11	High voltage insulators	Degradation of insulation quality due to presence of any salt deposits and surface contamination; loss of material caused by mechanical wear due to wind blowing on transmission conductors	Plant specific	Yes, plant specific	NUREG-1801 aging effect is not applicable to JAFNPP. See Section 3.6.2.2.2 for further evaluation.
3.6.1-12	Transmission conductors and connections; Switchyard bus and connections	Loss of material due to wind induced abrasion and fatigue; loss of conductor strength due to corrosion; increased resistance of connection due to oxidation or loss of preload	Plant specific	Yes, plant specific	NUREG-1801 aging effect is not applicable to JAFNPP. See Section 3.6.2.2.3 for further evaluation.
3.6.1-13	Cable connections metallic parts	Loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements	No	NUREG-1801 aging effect is not applicable to JAFNPP. Cable connections outside of active devices are taped or sleeved for protection. Operating experience with metallic parts of electrical cable connections at JAFNPP indicated no aging effects requiring management.

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-14	Fuse holders (not part of a larger assembly) – Insulation material	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.

Notes for Table 3.6.2-1

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. 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

None

Table 3.6.2-1
Electrical Components
Summary of Aging Management Evaluation

Table 3.6.2-1: Electrical Components								
Structure and/or Component/ Commodity	**Component Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Cable connections (metallic parts)	Conducts electricity	Various metals used for electrical connections	Heat or radiation and air	None	None			I
Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements (JAFNPP electrical penetration conductors and connections are EQ)	Conducts electricity	Insulation material – various organic polymers	Heat or radiation and air	Reduced insulation resistance (IR)	Non-EQ Insulated Cables and Connections	VI.A-2 (L-01) VI.A-6 (LP-03)	3.6.1-2	A
Electrical cables not subject to 10 CFR 50.49 Environmental Qualification requirements used in instrumentation circuits	Conducts electricity	Insulation material – various organic polymers	Heat or radiation and air	Reduced insulation resistance (IR)	Non-EQ Instrumentation Circuits Test Review	VI.A-3 (L-02)	3.6.1-3	A

Table 3.6.2-1: Electrical Components

Structure and/or Component/ Commodity	Component Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fuse holders (insulation material)	Insulation (electrical)	Insulation material – various organic polymers	Heat or radiation and air	None	None	VI.A-7 (LP-02)	3.6.1-14	A
High voltage insulators (for SBO)	Insulation (electrical)	Porcelain, galvanized metal, cement	Outdoor weather	None	None			I
Metal-enclosed bus (non-segregated bus for SBO), connections	Conducts electricity	Aluminum, copper, steel	Heat and air Outdoor weather	Thermal cycling and ohmic heating	Metal-Enclosed Bus Inspection	VI.A-11 (LP-04)	3.6.1-7	A
Metal-enclosed bus (non-segregated bus for SBO), insulation/ insulators	Insulation (electrical)	Porcelain, galvanized iron, or steel	Heat and air Outdoor weather	Loss of material	Metal-Enclosed Bus Inspection	VI.A-14 (LP-05)	3.6.1-8	A
Metal-enclosed bus (non-segregated bus for SBO) enclosure assemblies	Support for Criterion (a)(3) equipment	Steel	Heat and air Outdoor weather	Loss of material due to general corrosion	Metal-Enclosed Bus Inspection	VI.A-13 (LP-06)	3.6.1-9	E
Metal-enclosed bus (non-segregated bus for SBO) enclosure assemblies	Support for Criterion (a)(3) equipment	Elastomers	Heat and air Outdoor weather	Elastomer degradation	Metal-Enclosed Bus Inspection	VI.A-12 (LP-10)	3.6.1-10	E

Table 3.6.2-1: Electrical Components

Structure and/or Component/ Commodity	Component Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Oil-filled cable system (passive mechanical for SBO)	Pressure boundary	Carbon steel, stainless steel, copper alloy, glass	Oil (internal) Outdoor weather (external)	Loss of material	Oil Analysis External Surfaces Monitoring			J
Oil-filled cable system (passive electrical for SBO)	Conducts electricity	Insulation material – various organic polymers	Moisture and voltage stress	None	None			J
Switchyard bus (switchyard bus for SBO), connections	Conducts electricity	Aluminum, copper	Outdoor weather	None	None			I
Transmission conductors (transmission conductors for SBO), connections	Conducts electricity	Aluminum, steel, steel alloy	Outdoor weather	None	None			I

4.0 TIME-LIMITED AGING ANALYSES

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 time-limited aging analyses (TLAA) as part of the application for a renewed license. Section 10 CFR 54.21(c)(2) requires a list of current exemptions to 10 CFR 50 based on TLAA as part of 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.

4.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

The regulations governing reactor vessel integrity are in 10 CFR 50. Section 50.60 requires that all light-water reactors meet the fracture toughness, pressure-temperature limits, and material surveillance program requirements for the reactor coolant pressure boundary as set forth in 10 CFR 50 Appendices G and H.

The JAFNPP current licensing basis analyses evaluating reduction of fracture toughness of the reactor vessel for 40 years are TLAA. The reactor vessel neutron embrittlement TLAA has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii) as summarized below. Fifty-four effective full-power years (EFPY) are projected for the end of the period of extended operation (60 years) based on an average capacity factor of 90%.

4.2.1 Reactor Vessel Fluence

Calculated fluence is based on a time-limited assumption defined by the operating term. As such, fluence is the time-limited assumption for the time-limited aging analyses that evaluate reactor vessel neutron embrittlement.

The 32 EFPY fluence is based on a General Electric analysis of measured fluence from the JAFNPP surveillance flux wires which allows for 5% power uprate completed after flux wire removal. These fluence values were further extrapolated to 54 EFPY to obtain peak plate ID fluences with 1/4 T values derived using RG 1.99 formula and conservative wall thicknesses.

The following fluence values are used throughout the remainder of Section 4.2.

Location	Surface Fluence, n/cm^2	1/4 T Fluence, n/cm^2
Lower shell	2.71E+18	1.85E+18
Lower intermediate shell	3.05E+18	2.21E+18
Lower shell axial welds	2.55E+18	1.74E+18
Lower intermediate shell axial welds	1.89E+18	1.29E+18
Lower shell to lower intermediate shell circumferential welds	2.71E+18	1.85E+18

The beltline for 40 years consists of 6 plates (C3103-2, C3278-2, C3301-1, C3368-1, C3376-2, and C3394-1), six axial welds (1-233A/B/C and 2-233A/B/C) and one circumferential weld (1-240), all adjacent to the active fuel zone. There are no nozzles in the beltline region for the current term of operation. The beltline has been re-evaluated for 60 years based on the axial flux profile and the active fuel and nozzle elevations. Fluence at the recirculation inlet nozzles (the closest low-alloy steel nozzles to the beltline) will not exceed 1.0 x 10^{17} n/cm^2 during the period of extended operation. The plate and weld material in the beltline remain the limiting materials for the period of extended operation.

4.2.2 Pressure-Temperature Limits

Appendix G of 10 CFR 50 requires that reactor vessel boltup, hydrotest, pressure tests, normal operation, and anticipated operational occurrences be accomplished within established pressure-temperature (P-T) limits. These limits are established by calculations that utilize the materials and fluence data obtained through the Reactor Vessel Surveillance Program.

Technical Specifications (Reference 4.2-2) contain pressure/temperature limits valid through 32 EFPY. The fact that the projected maximum RT_{NDT} is well below the 200°F suggested in Section 3 of Regulatory Guide 1.99 gives confidence that pressure/temperature curves will provide acceptable operating area through 54 EFPY. The BWRVIP Integrated Surveillance Program (BWRVIP Reports 86-A, 102, 116 and 135), as approved by the NRC, will be used to *adjust projected* RT_{NDT} *values as additional surveillance capsule results are collected.* JAFNPP will submit additional P-T curves prior to the period of extended operation.

4.2.3 Charpy Upper-Shelf Energy

Appendix G of 10 CFR 50 requires that reactor vessel beltline materials "have Charpy upper shelf energy ... of no less than 75 ft-lb initially and must maintain Charpy upper-shelf energy throughout the life of the vessel of no less than 50 ft-lb...." The initial (unirradiated) values of upper-shelf energy (C_VUSE) for JAFNPP beltline materials were provided to the NRC in correspondence responding to Generic Letter 92-01 and are now included in RVID2 and BWRVIP-135 (References 4.2-3, 4.2-4, 4.2-5).

Regulatory Guide 1.99, "Radiation Embrittlement of Reactor Vessel Materials," Revision 2, provides two methods for determining Charpy upper-shelf energy (C_VUSE). Position 1 applies for material that does not have surveillance data, and Position 2 applies for material with at least two sets of surveillance data. JAFNPP has two surveillance data sets from the reactor vessel plate material showing changes in C_VUSE. However, since the observed changes are less than the Regulatory Guide 1.99 projected changes, Position 1 is used which conservatively does not reduce the projections based on surveillance data. For Position 1, the percent drop in C_VUSE for a stated copper content and neutron fluence is determined by reference to Figure 2 of Regulatory Guide 1.99, Revision 2. This percentage drop is applied to the initial C_VUSE to obtain the adjusted C_VUSE.

The reactor vessel plates are projected to remain above 50 ft-lbs as shown in Table 4.2-2; consequently no equivalent margin analysis (EMA) is required for the plates. However, no initial C_VUSE is available for the reactor vessel weld material, so the decrease from the original value cannot be calculated, and an EMA must be performed. The original EMAs for JAFNPP plates and welds were submitted to the NRC and updated to include the second surveillance capsule data (References 4.2-1, 4.2-3). Table 4.2-1 summarizes the results of these EMAs and extrapolates those results to 54 EFPY, using Position 1 of Regulatory Guide 1.99 as discussed above. The results show that the reduction in C_VUSE calculated for the plates and welds remain less than the limiting reduction calculated in BWRVIP-74-A. As such, the welds are acceptable for the period of extended operation.

All extrapolated C_VUSE values for reactor vessel plates are predicted to remain well above the requirement of 50 ft-lbs during the period of extended operation as shown in Table 4.2-2. All equivalent margin analyses for reactor vessel welds show reductions of C_VUSE that are less than the BWRVIP-74-A reductions. As such, all TLAA associated with C_VUSE have been extrapolated through the period of extended operation and are acceptable. These TLAA have been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

Table 4.2-1
JAFNPP Charpy Upper-Shelf Energy Equivalent Margin Analysis

Surveillance Weld	
Surveillance Weld % Cu	0.29%
Surveillance Weld Fluence (n/cm^2)	5.00E+17
Surveillance Weld Measured Decrease (%)	Unknown
RG 1.99 Predicted Decrease (%)	22
Ratio of Measured to Predicted	1.000
Limiting Extrapolated Weld (1-240)	
Beltline Weld % Cu	0.337
54 EFPY 1/4 T fluence (n/cm^2)	1.723E+18
RG 1.99 Predicted Decrease (%)	31.46
Adjusted % Decrease (%)	31.46
Limiting % Decrease (%)	39.0
Acceptable	Yes

Table 4.2-2
JAFNPP Charpy Upper-Shelf Energy Data for 54 Effective Full-Power Years (EFPY)

Material Description						54 EFPY Projection		
Reactor Vessel Beltline Region Location	Material Type	Material Identification	Heat #	%Cu	Unirradiated C_VUSE	1/4 T fluence (10^{19} n/cm^2)	% Drop in USE	USE (1/4 T)
Lower shell	A533B	157	C3394-1	0.11	85.6	0.1851	13.4	74.1
Lower shell	A533B	158	C3376-2	0.13	77.4	0.1851	14.8	66.0
Lower shell	A533B	159	C3103-2	0.14	82.6	0.1851	15.4	69.9
Lower intermediate shell	A533B	160	C3368-1	0.12	67.0	0.2210	14.7	57.2
Lower intermediate shell	A533B	161	C3301-1	0.18	82.3	0.2210	18.9	66.8
Lower intermediate shell	A533B	162	C3278-2	0.11	84.3	0.2210	14.0	72.5
Lower int. shell axial welds 1-233A/B/C	Linde 1092	608	13253 & 12008	0.210	Not available	0.2210	24.48	EMA
Lower shell axial welds 2-233A/B/C	Linde 1092	609	27204 & 12008	0.219	Not available	0.1851	24.08	EMA
Circ weld 1-240	Linde 1092	610	305414	0.337	Not available	0.1851	31.99	EMA

4.2.4 Adjusted Reference Temperature

Irradiation by high-energy neutrons raises the value of RT_{NDT} for the reactor vessel. The initial RT_{NDT} is determined through testing of unirradiated material specimens. The shift in reference temperature, ΔRT_{NDT}, is the difference in the 30 ft-lb index temperatures from the average Charpy curves measured before and after irradiation. The adjusted reference temperature (ART) is defined as initial RT_{NDT} + ΔRT_{NDT} + margin. Regulation Guide 1.99, Revision 2 defines the calculation for ΔRT_{NDT}, margin, and ART. The P-T curves are developed from the ART value for the vessel materials.

JAFNPP projected values for ΔRT_{NDT} and ART at 54 EFPY using the methodology of RG 1.99 Position 1. The projected values of ART are shown in Table 4.2-3. These values were calculated using the chemistry data, margin values, initial RT_{NDT} values, and chemistry factors (CFs) contained in the JAFNPP response to GL 92-01 (Reference 4.2-3). The 1/4 T fluence values discussed in Section 4.2.1 were used. New fluence factors (FFs) were calculated using the expression in RG 1.99, Revision 2, Equation 2, where the fluence factor is given by

$$FF = f^{(0.28-0.10*\log f)}$$

In this equation, *f* is the 1/4 T fluence value. The new ΔRT_{NDT} values were calculated by multiplying the CF and the FF for each plate and weld. Calculated margins and the initial RT_{NDT} were then added to the calculated ΔRT_{NDT} in order to arrive at the new value of ART.

Table 4.2-3 projects ART through the period of extended operation. All projected values for ART are well below the 200°F suggested in Section 3 of Regulatory Guide 1.99 (for 1/4 T) and are thus acceptable for the period of extended operation. The TLAA for ART is thus projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

Table 4.2-3
JAFNPP RT_{NDT} Data for 54 Effective Full-Power Years (EFPY)

Initial Material Description									54 EFPY Extrapolation					
Reactor Vessel Beltline Region Location	Material Type	Material Identifier	Heat #	%Cu	%Ni	Chemistry Factor	Initial RT_{NDT} (°F)	σ_u	1/4 T fluence (10^{19} n/cm^2)	Fluence Factor	ΔRT_{NDT} (Deg F)	σ_Δ	Margin (Deg F)	ART_{NDT} (Deg F)
Lower shell	A533B	157	C3394-1	0.11	0.560	73.60	-10.0	0	0.1851	0.551	40.6	17.0	34.0	64.6
Lower shell	A533B	158	C3376-2	0.13	0.600	91.00	24.0	0	0.1851	0.551	50.1	17.0	34.0	108.1
Lower shell	A533B	159	C3103-2	0.14	0.570	98.65	-2.0	0	0.1851	0.551	54.4	17.0	34.0	86.4
Lower intermediate shell	A533B	160	C3368-1	0.12	0.500	81.00	-10.0	0	0.2210	0.594	48.1	17.0	34.0	72.1
Lower intermediate shell	A533B	161	C3301-1	0.18	0.570	131.15	-18.0	0	0.2210	0.594	77.8	17.0	34.0	93.8
Lower intermediate shell	A533B	162	C3278-2	0.11	0.600	29.40	-10.0	0	0.2210	0.594	17.4	0.0	16.0	23.4
Lower int shell axial welds 1-233A/B/C	Linde 1092	608	13253 & 12008	0.210	0.873	208.68	-50	0	0.2210[1]	0.594	123.9	28.0	56.0	129.9
Lower shell axial welds 2-233A/B/C	Linde 1092	609	27204 & 12008	0.219	0.996	231.06	-48	0	0.1851[1]	0.551	127.3	28.0	56.0	135.3
Circ weld 1-240	Linde 1092	610	305414	0.337	0.609	209.11	-50	0	0.1851[1]	0.551	115.2	28.0	56.0	121.2

1. No credit is taken for axial and azimuthal lead factors to reduce peak fluence.

4.2.5 Reactor Vessel Circumferential Weld Inspection Relief

Relief from reactor vessel circumferential weld examination requirements under BWRVIP-05 is based on an analysis indicating acceptable probability of failure per reactor operating year. The analysis is based on reactor vessel metallurgical conditions as well as flaw indication sizes and frequencies of occurrence that are expected at the end of a licensed operating period. (Reference 4.2-7)

JAFNPP received NRC approval for this relief for the third ISI interval based on evaluation of the welds to the end of the current operating license (32 EFPY) (Reference 4.2-6). The changes in metallurgical conditions expected over the period of extended operation require additional analysis for 54 EFPY. The JAFNPP relief request included an analysis that showed that the reactor vessel parameters after 32 EFPY were within the NRC's 32 EFPY bounding CEOG vessel parameters from the BWRVIP-05 SER. As such, there is a lower conditional probability of failure for circumferential welds at JAFNPP than that stated in the NRC's Final Safety Evaluation Report of BWRVIP-05.

Table 4.2-4 compares the JAFNPP reactor vessel limiting circumferential weld parameters to those used in the NRC analysis. The data in the second column (CEOG 32 EFPY) is from Table 2.6-4 of the NRC SER for BWRVIP-05 (Reference 4.2-7). The data in the third column (JAFNPP 32 EFPY) is from the NRC SER for JAFNPP Relief Request 17 (Reference 4.2-6). The data in the fourth column (CE 64 EFPY) is from Table 2.6-5 of the Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report (Reference 4.2-7). The data in the last column is the projected 54 EFPY data for JAFNPP taken from Table 4.2-3. (Consistent with earlier submittals, this table uses surface fluence rather than 1/4 T fluence without margin for RT_{NDT}, so the resulting change in RT_{NDT} is different from that shown in Table 4.2-3.)

The JAFNPP reactor pressure vessel circumferential weld parameters at 54 EFPY will remain within the NRC's (64 EFPY) bounding CEOG parameters from the BWRVIP-05 SER. Although a conditional failure probability has not been calculated, 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 JAFNPP RPV conditional failure probability is bounded by the NRC analysis. As such, the conditional probability of failure for circumferential welds remains below that stated in the NRC's Final Safety Evaluation of BWRVIP-05. Therefore, this analysis has been projected through the period of extended operation per 10 CFR 54.21 (c)(1)(ii).

The procedures and training used to limit cold over-pressure events will be the same as those approved by the NRC when JAFNPP requested approval of the BWRVIP-05 technical alternative for the current license term.

Table 4.2-4
Effects of Irradiation on JAFNPP RPV Circumferential Weld Properties

Plant / Parameter Description	CEOG/ 32 EFPY Bounding Parameters	JAFNPP/ 32 EFPY Bounding Weld (1-240)	CEOG/ 64 EFPY Bounding Parameters	JAFNPP/ 54 EFPY Beltline Circ Weld
Initial (unirradiated) reference temperature (RT_{NDT}), °F	0	-50	0	-50
Neutron fluence at the end of the requested relief period, n/cm^2	2.00×10^{18}	1.61×10^{18}	4.00×10^{18}	2.71×10^{18}
Fluence factor (FF) (calculated per RG1.99 based on fluence in previous line)	0.569	0.519	0.746	0.644
Weld copper content, %	0.183	0.337	0.183	0.337
Weld nickel content, %	0.704	0.609	0.704	0.609
Weld chemistry factor (CF)	172.2	209.1	172.2	209.1
Fluence factor times chemistry factor (FF x CF)	98.1	108.5	128.5	134.7
Margin (implied), °F	0.0	0.0	0.0	0.0
Increase in reference temperature (ΔRT_{NDT}), °F (FF x CF + Margin)	98.1	108.5	128.5	134.7
Mean adjusted reference temperature (ART), °F ($RT_{NDT} + \Delta RT_{NDT}$)	98.1	58.5	128.5	84.7

4.2.6 Reactor Vessel Axial Weld Failure Probability

The BWRVIP recommendations for inspection of reactor vessel shell welds (BWRVIP-05) are based on generic analyses supporting an NRC SER conclusion that the generic-plant axial weld failure rate is no more than 5×10^{-6} per reactor year (Reference 4.2-7). BWRVIP-05 showed that this axial weld failure rate is orders of magnitude greater than the 40-year end-of-life circumferential weld failure probability, and used this analysis to justify relief from inspection of the circumferential welds as described above.

Table 4.2-5 compares the JAFNPP reactor vessel limiting axial weld parameters to those used in the NRC analysis. The data in the second column (CEOG 32 EFPY) is from Table 2.6-4 of the NRC SER for BWRVIP-05 (Reference 4.2-7). The data in the third column is based on the projected 32 EFPY fluence for JAFNPP and the limiting weld chemistry. The data in the fourth column is from Table 2.6-5 of the NRC SER for BWRVIP-05 (Reference 4.2-7). The data in the last column is the projected 54 EFPY data for JAFNPP taken from Table 4.2-3. (For consistency with Columns 2 and 3, the EOL mean RT_{NDT} is calculated without margin and hence is lower than the Table 4.2-3 RT_{NDT} value.)

The limiting axial weld parameters are within the limits of the values assumed in the analysis performed by the NRC staff in the BWRVIP-05 supplemental SER and the 64 EFPY limits and values obtained from Table 2.6-5 of the SER. As such, this TLAA has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

Table 4.2-5
Effects of Irradiation on JAFNPP RPV Axial Weld Properties

Plant / Parameter Description	CEOG NRC Limiting Plant-Specific Data	JAFNPP Data for Weld 2-233A/B/C	CEOG NRC Limiting Plant-Specific Data	JAFNPP Data for Weld 2-233A/B/C
EFPY	32	32	64	54
Initial (unirradiated) reference temperature (RT_{NDT}), °F	0	-48	0	-48
Neutron fluence, n/cm^2	2.00E+18	1.51E+18	4.0E+18	2.55E+18
Fluence factor (FF) (calculated per RG1.99 based on fluence in previous line)	0.569	0.504	0.746	0.629
Weld copper content, %	0.219	0.219	0.219	0.219
Weld nickel content, %	0.996	0.996	0.996	0.996
Weld chemistry factor (CF)	231.1	231.1	231.1	231.1
Fluence factor times chemistry factor (FF x CF)	131.6	116.5	172.4	145.2
Margin (implied), °F	0.0	0.0	0.0	0.0
Increase in reference temperature (ΔRT_{NDT}), °F (FF x CF + Margin)	131.6	116.5	172.4	145.2
Mean adjusted reference temperature (ART), °F (RT_{NDT} + ΔRT_{NDT})	131.6	68.5	172.4	97.2

4.2.7 References

4.2-1 GE-NE-B1100732-01, Plant FitzPatrick RPV Surveillance Materials Testing and Analysis of 120° Capsule at 13.4 EFPY, Revision 1, February 1998.

4.2-2 Technical Specifications LCOs and SRs, James A. FitzPatrick Nuclear Power Plant, Amendment 282.

4.2-3 Josiger, W. A. (NYPA), to USNRC Document Control Desk, "James A. FitzPatrick Nuclear Power Plant, Docket No. 50-333, Generic Letter 92-01, Revision 1, Reactor Vessel Structural Integrity," letter JPN-94-041 dated August 10, 1994.

4.2-4 BWRVIP-135 (EPRI Report 1011019), "BWR Vessel and Internals Project, Integrated Surveillance Program (ISP) Data Source Book and Plant Evaluations," 2004.

4.2-5 RVID2, NRC's Reactor Vessel Integrity Database, Version 2.

4.2-6 Gamberoni, M. K. (NRC), to J. Knubel (PASNY), "Relief Request No. 17 - Request for Relief from the Requirements of 10CFR50.55a(g)(6)(ii)(A)(2) for Augmented Inspection of the Circumferential Welds in the Reactor Vessel of the James A. FitzPatrick Nuclear Power Plant (TAC No. MA6215)," letter dated February 22, 2000.

4.2-7 Lainas, G. C. (NRC), to C. Terry (BWRVIP), "Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report (TAC No. M93925)," letter dated July 28, 1998.

4.3 METAL FATIGUE

Fatigue analyses are potential TLAA for Class 1 and selected 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 that becomes evident by cracking of the component.

The aging management reviews (Section 3) for JAFNPP 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, associated fatigue analyses are reviewed in this section for TLAA. Review 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.

If the TLAA does not remain valid or cannot be satisfactorily projected to the end of the period of extended operation, then cracking due to fatigue is the aging effect requiring management under 10 CFR 54.21(c)(1)(iii).

Components designed in accordance with ASME Section III, Subsection NB are required to have fatigue analyses. ASME Section III requires evaluation of fatigue by considering design thermal and loading cycles. JAFNPP monitors transient cycles that contribute to fatigue usage in accordance with requirements in Technical Specification 5.5.5. Cumulative usage factors have been documented and the actual numbers of design transient cycles have been projected to 60 years. A program is in place to track cycles and to provide corrective actions if limits are approached. The maximum cumulative usage factors (CUF) identified for JAFNPP components are summarized in Table 4.3-1.

Reactor coolant system pressure boundary piping was designed to ANSI B31.1 and secondary stresses (e.g., stress due to thermal expansion and anchor movements) are analyzed for fatigue using stress intensification factors (SIFs) and stress range allowables. The stress range allowables are a function of thermal design cycles.

In addition to metal fatigue analyses, fracture mechanics analyses of flaw indications discovered during inservice inspection are TLAA for those analyses based on time-limited assumptions defined by the current operating term. When a flaw is detected during inservice inspections, the component that contains the flaw can be evaluated for continued service in accordance with ASME Section XI. These evaluations may show the component is acceptable at the end of the current operating term based on projected inservice flaw growth. Flaw growth is typically predicted based on the design thermal and loading cycles.

4.3.1 Class 1 Fatigue

JAFNPP Class 1 components evaluated for fatigue and flaw growth include the reactor pressure vessel (RPV) and appurtenances, certain reactor vessel internals, and the reactor coolant system (RCS) pressure boundary. The JAFNPP Class 1 systems include components within the ASME Section XI, Subsection IWB inspection boundary (see Section 2.3.1 and Section 3.1).

Fatigue evaluations were performed in the design of the JAFNPP Class 1 components in accordance with the requirements specified in ASME Section III. The fatigue evaluations are contained in analyses and stress reports, and because they are based on a number of transient cycles assumed for a 60-year plant life, 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 that were used in the design of the components and are included as part of each component analysis or stress report.

A review of the fatigue evaluations reveals the maximum cumulative usage factors (CUFs) for applicable JAFNPP Class 1 components. The documents reviewed are current design basis fatigue evaluations that do not consider the effects of reactor water environment on fatigue life. The maximum CUFs for Class 1 components are summarized in Table 4.3-1.

Table 4.3-1
Maximum CUFs for Class 1 Components
(Based on Design Transients)

Location	CUF
Closure shell	0.13
Vessel shell – closure region	0.40
Closure region bolts	0.504
Vessel shell (other than closure and bottom head regions)	0.89
Bottom head – dome segment at penetration	0.03
Vessel support skirt at head attach	0.20
Feedwater nozzle safe end	0.8392
Feedwater nozzle inner blend radius	0.1626
Core spray nozzle	0.18
CRD hydraulic system return nozzle (cut and capped)	0.12
Recirculation inlet nozzle (safe end)	0.0132
Recirculation inlet nozzle (thermal sleeve)	0.3154
Recirculation outlet nozzle	0.43
Vent nozzle	0.17
6" instrument/head spray nozzle	0.13
CRD nozzle (penetration)	0.0234
Shroud support and attachments	0.90
Basin seal skirt	0.0007

In accordance with plant Technical Specifications (Section 5.5.5), JAFNPP must ensure that the numbers of transient cycles experienced by the plant remains within the allowable numbers of cycles. Current design basis fatigue evaluations, including the CUFs, are based on design transients. The design transients are listed in Table 4.3-2.

The Fatigue Monitoring Program tracks and evaluates the 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, and hence the component CUFs remain below the code allowable value of 1.0. Further details on the Fatigue Monitoring Program are provided in Appendix B.

The numbers of cycles accrued to date have been extrapolated to determine the numbers of cycles expected at the end of 60 years of operation. Table 4.3-2 shows the extrapolated values for the period of extended operation.

Table 4.3-2
Projected Cycles

	Design Transient	Current Design Basis Cycles, Allowable	Updated 60 Year Cycle Projection
1	Bolt-up (70°F)	36	35
2	Design Hydro Test (1250 psig, 100°F)	36	35
3	Startup (100°F/hr to 546°F)	233	216
4	Turbine Roll and Increase to Rated Power	221	204
5	Daily Reduction to 75% Power	7566	6674
6	Weekly Reduction to 50% Power	1685	1526
7,8	Rod Worth Test (Sequence Exchange)	357	310
9	Turbine Trip at 25% Power	7	7
10	Feedwater Heater Bypass	34	32
11	Loss of FW Pumps, SIVs close	12	10
12	Turbine Generator Trip, FW on, SIVs stay open	12	12
13	Reactor Overpressure	1	0
14	Single Relief Valve Blowdown	2	1
15	All Other Scrams	64	62
17	Improper Start of Cold Recirc. Loop	5	0
18	Sudden Start of Pump—Cold Recirc.	5	0
	Shutdowns[1]	233	244
19	Reduction to 0% Power		
20	Hot Standby		
21	Cooldown (100°F/hr to 375°F)		
22	Vessel Flooding (375°F to 330°F in 10 min.)		
23	Cooldown (100°F/hr to 100°F)		
24	Hydrostatic Test(1563 psig)	1	1
25	Unbolt	35	34

1. Not all shutdowns counted and projected are equivalent full temperature events. Therefore, the effective number of shutdowns is less than the value shown.

4.3.1.1 Reactor Vessel

The reactor pressure vessel was designed in accordance with ASME Section III. Fatigue analyses were performed as required based on an allowed number of transient cycles.

An evaluation of fatigue usage factors was performed in 2002 accounting for sixty years of operation. This analysis projected that all components of the vessel would have fatigue usage factors below 1.0. Not all reactor vessel components have fatigue usage factors. Fatigue analyses were originally performed for limiting components of the vessel, as listed in Table 4.3-1. Fatigue usage factors for other vessel components not listed in Table 4.3-1 are bounded by the most limiting location. Therefore, the TLAA (fatigue analyses) for reactor pressure vessel fatigue remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.3.1.2 Reactor Vessel Internals

Although not mandatory, the design of the reactor vessel internals is in accordance with the intent of ASME Section III. A fatigue analysis of the internals determined the maximum fatigue usage occurs in the jet pump-shroud-shroud support area at the ID of the jet pump diffuser adapter at the thin end of the tapered transition section. The maximum CUF identified in this area for 40 years of operation is 0.65. The usage factor is projected to 60 years of operation by multiplying by 1.5, resulting in a CUF of 0.98 for the ID of jet pump diffuser at transition.

A fatigue evaluation was also performed on the tie rod assemblies installed as part of the core shroud repair. The maximum CUF for the tie rod components is 0.0575 for the spring rod based on 120 startups/shutdowns. The current number of startups/shutdowns allowed for 60 years of operation is 233. Therefore, a conservative projection of the fatigue usage of the tie rods for 60 years of operation would be (233/120) x 0.0575, which equals a CUF of 0.11.

The analyses for the jet pump diffuser at transition and the shroud tie rod assembly have been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.3.1.3 Class 1 Piping and Components

All RCS pressure boundary piping is designed and analyzed in accordance with ANSI B31.1.

In the ANSI B31.1 code, fatigue is addressed by using stress range reduction factors to reduce stress allowable (SA). Components with less than 7,000 equivalent full temperature cycles are limited to the calculated SA without reduction per ANSI B31.1.0. Components that exceed 7,000 equivalent full temperature cycles have allowable stresses reduced through the application of stress range reduction factors. Since the RCPB will not exceed 7000 full temperature cycles in 60 years of operation, existing stress analyses remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.3.2 Non-Class 1 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. JAFNPP evaluated the validity of this assumption for 60 years of plant operation. The results of this evaluation indicate that the 7000 thermal cycle assumption is valid and bounding for 60 years of operation. Therefore, the pipe stress calculations are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Non-class 1 components, other than piping system components, required fatigue analyses only if they were built to ASME Section III, NC-3200 or ASME Section VIII, Division 2. JAFNPP has no non-class 1 components built to these codes and therefore has no associated TLAA for components other than piping system components.

4.3.3 Effects of Reactor Water Environment on Fatigue Life

NUREG/CR-6260 applied fatigue design curves that incorporated environmental effects to several plants and identified locations of interest for consideration of environmental effects. Section 5.7 of NUREG/CR-6260 identified the following component locations as most sensitive to environmental effects for General Electric plants similar to JAFNPP. These locations and the subsequent calculations are directly relevant to JAFNPP.

(1) reactor vessel shell and lower head
(2) reactor vessel feedwater nozzles
(3) reactor recirculation (RR) piping (including inlet and outlet nozzles)
(4) core spray line reactor vessel nozzle and associated piping
(5) residual heat removal (RHR) return piping
(6) feedwater piping

JAFNPP evaluated the limiting locations using the guidance provided in NUREG-1801 (Volume 2, Section X.M.1), using the fatigue life correction factors, Fen, reported in NUREG/CR-5704 and NUREG/CR-6583. Four of nine components reviewed at these locations have environmentally adjusted CUF of greater than 1.0 (see Table 4.3-3).

Prior to entering the period of extended operation, for each location that may exceed a CUF of 1.0 when considering environmental effects, JAFNPP will implement one or more of the following:

(1) further refinement of the fatigue analyses to lower the predicted CUFs to less than 1.0 using an NRC-approved method;

(2) management of fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive

examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC);

(3) *repair or replacement of the affected locations.*

Should JAFNPP select the option to manage environmental-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be submitted to the NRC prior to the period of extended operation.

The effects of environmental-assisted thermal fatigue for the limiting locations identified in NUREG-6260 have been evaluated. Depending on the option chosen, which may vary by component, this TLAA will be projected through the period of extended operation or the effects of environmentally assisted fatigue will be managed per 10 CFR 54.21(c)(1)(iii). For those locations with CUFs less than 1.0, the TLAA has been projected through the period of extended operation per 10CFR54.21(c)(1)(ii).

Table 4.3-3
JAFNPP Cumulative Usage Factors for NUREG/CR-6260 Limiting Locations
(Based on Design Transients)

NUREG-6260 Components	CUF	Material	Fen	Environmentally Adjusted CUF
Vessel shell	0.89	Low alloy steel	2.5	2.18
Bottom head	0.03	Low alloy steel	2.5	0.07
Vessel feedwater nozzle safe end	0.84	Low alloy steel	3.3	2.75
Vessel RR inlet nozzle thermal sleeve	0.32	Austenitic stainless steel	15.4	4.93
Vessel RR outlet nozzles	0.43	Low alloy steel	2.5	1.06
Vessel core spray nozzles	0.18	Low alloy steel	2.5	0.44
RHR return line class 1 piping[1]	NA	Austenitic stainless steel	15.4	NA
RHR return line tee to RR system[1]	NA	Austenitic stainless steel	15.4	NA
Feedwater line Class 1 piping[1]	NA	Carbon steel	2.3	NA

1. No JAFNPP specific fatigue analysis since components are designed per ASME B31.1 code.

4.4 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC EQUIPMENT

The Environmental Qualification of Electric Components (EQ) 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. Aging evaluations for EQ components that specify a qualification of at least 40 years are considered TLAA for license renewal. The EQ Program ensures that these EQ components are maintained in accordance with their qualification bases.

The program is an existing program established to meet JAFNPP commitments for 10 CFR 50.49. It is consistent with NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components."

The program includes consideration of operating experience to modify qualification bases and conclusions, including qualified life. Compliance with 10 CFR 50.49 provides reasonable assurance that components can perform their intended function(s) during accident conditions after experiencing the effects of inservice aging. Consistent with NRC guidance provided in RIS 2003-09, no additional information is required to address GSI 168, "EQ of Electrical Components."

Based upon a review of the existing program and associated operating experience, continued implementation of the Environmental Qualification of Electrical Components Program provides reasonable assurance that the aging effects will be managed and that the in-scope EQ components will continue to perform their intended function(s) for the period of extended operation. The effects of aging will be managed by the program in accordance with 10 CFR 54.21(c)(1)(iii).

4.5 CONCRETE CONTAINMENT TENDON PRESTRESS

This section is not applicable since JAFNPP does not have pre-stressed tendons in the containment building.

4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENT, AND PENETRATIONS FATIGUE ANALYSIS

4.6.1 Fatigue of Primary Containment

The JAFNPP containment was analyzed as part of the Mark I containment long term program (Reference 4.6-1) using methods and assumptions consistent with NUREG-0661.

The Mark I containment long-term program analyzed the torus and attached piping systems for fatigue due to mechanical loadings as well as thermal and anchor motion. This analysis was based on assumptions of the number of SRV actuations, operating basis earthquakes, and accident conditions during the life of the plant.

The analysis considered all BWR plants which utilize the Mark I containment design. The analysis concluded that for all plants and piping systems considered, the fatigue usage factor for an assumed 40-year plant life was less than 0.5. Extending plant life by an additional 20 years would produce a usage factor below 0.75. Since this is less than 1.0, the fatigue criteria are satisfied. This TLAA has been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.6.2 References

4.6-1 Technical Report MPR-751, Mark I Containment Program Augmented Class 2/3 Fatigue Evaluation Method and Results for Typical Torus Attached and SRV Piping Systems, November 1982.

4.7 OTHER PLANT-SPECIFIC TLAA

4.7.1 Recirculation Isolation Valves

Referencing the recirculation isolation valves, the UFSAR states, "For fatigue evaluations consider 30 cycles of normal pressurization followed by blowdown and 270 cycles of normal pressurization followed by normal depressurization."

As these valves are not ASME class valves, no specific fatigue analysis was required; however, the number of cycles suggested by the UFSAR is greater than the number of cycles allowed as part of the Fatigue Monitoring Program, so the transients suggested will not be exceeded. Thus this TLAA will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.7.2 Leak before Break

The UFSAR addresses reactor coolant system leakage rates and leakage detection systems. The leak before break analysis assumes that a pipe will first crack and gradually increase the amount of leakage until reaching the critical crack length at which the crack rapidly propagates into a break. The leak detection systems are designed to detect and in some cases automatically isolate a leak before it becomes a break. The crack growth analysis supporting these leak detection systems is a TLAA. Prior to the period of extended operation, JAFNPP will revise the leak detection systems supporting documentation such that either (1) it does not include a TLAA, or (2) the existing TLAA is projected through the period of extended operation.

4.7.3 TLAA in BWRVIP Documents

The BWR Vessel and Internals Project (BWRVIP) documents identify various potential TLAA. The TLAA applicable to JAFNPP are described below.

4.7.3.1 BWRVIP-05, Reactor Vessel Circumferential Welds

BWRVIP-05 justified elimination of reactor vessel circumferential welds from examination. BWRVIP-74 extended this justification to cover the period of license renewal. See Section 4.2.5 for review of the TLAA associated with this issue.

4.7.3.2 BWRVIP-25, Core Plate

The calculation of loss of preload on the core plate rim hold-down bolts is a potential TLAA per the NRC SER for BWRVIP-25 (Reference 4.7-2). BWRVIP-25 calculated the loss of preload for these bolts for forty years. Appendix B to BWRVIP-25 projected this calculation to 60 years, showing that the core hold down bolts at JAFNPP will retain at least 81% of their preload through the period of extended operation. Preload of the core plate holddown bolts is required to prevent lateral motion of the core plate for those plants that have not installed core plate wedges (including JAFNPP). A plant-specific calculation is required to determine minimum bolting requirements to prevent core plate motion. JAFNPP commits to perform a plant-specific calculation prior to the period of extended operation unless core plate wedges are installed during the remainder of the current licensing term. Thus the loss of core plate hold down bolt preload will be projected for the period of extended operation.

4.7.3.3 BWRVIP-38, Shroud Support

The BWRVIP-38 fatigue analysis of the shroud support is considered TLAA. The shroud support is included in the 60-year fatigue analysis and shows a CUF of 0.9. This analysis remains valid for the period of extended operation per 10 CFR 54.21(c)(1)(i).

4.7.3.4 BWRVIP-47-A, Lower Plenum

The BWRVIP-47 fatigue analysis of the lower plenum pressure boundary components is considered TLAA. The bottom head, shroud support, and CRD penetrations in the lower plenum are included in the 60-year fatigue analysis. Values for CUF are 0.03, 0.90, and 0.0234 respectively. This analysis remains valid for the period of extended operation per 10 CFR 54.21(c)(1)(i).

4.7.3.5 BWRVIP-74-A, Reactor Pressure Vessel

BWRVIP-74 and the NRC SER for BWRVIP-74 (Reference 4.7-1) discuss the following four TLAA.

(1) Pressure/Temperature Curve Analyses

The SER concludes "a set of P-T curves should be developed for the heatup and cooldown operating conditions in the plant at a given EFPY in the LR period." Section 4.2.2 addresses the JAFNPP P-T curves.

(2) Fatigue

The SER states that the license renewal applicant should not rely solely on the analysis in BWRVIP-74-A, but should verify that the number of cycles assumed in the original fatigue design is conservative. Section 4.3.1 addresses fatigue of the reactor pressure vessel.

The SER also states that NRC staff concerns on environmental fatigue were not resolved and that each applicant should address environmental fatigue for the components covered by BWRVIP-74-A. Section 4.3.3 addresses environmentally-assisted fatigue.

(3) Equivalent Margins Analysis for RPV Materials with Charpy USE Less than 50 ft-lbs

BWRVIP-74-A addresses that the percent reductions in Charpy USE for beltline materials are less than those specified for limiting BWR/3-6 plates and non-Linde 80 submerged arc welds. Section 4.2.3 addresses Charpy USE for reactor pressure vessel materials.

(4) Material Evaluation for Exempting RPV Circumferential Welds from Inspection

See Section 4.2.5 for a discussion of the RPV circumferential weld inspection relief.

4.7.3.6 BWRVIP-76, Core Shroud

Appendix K of BWRVIP-76 states that plant-specific analyses for shroud fatigue will be reviewed to determine if there is a TLAA. Upon review of the reactor vessel and internals design basis documents, no fatigue analysis nor calculation of cumulative usage factor was found for the shroud itself. Fatigue analyses (calculation of cumulative usage factors) were found for the shroud support and the shroud tie rod assemblies, and these are discussed in Section 4.3.1.2. This TLAA is projected through the period of extended operation per 10 CFR 54.21(c)(1)(ii).

4.7.4 References

4.7-1 Grimes, C. I. (NRC), to C. Terry (BWRVIP Chairman), "Acceptance for Referencing of EPRI Proprietary Report TR-113596, BWR Vessel and Internals Project, BWR Reactor Vessel Inspection and Flaw Evaluation Guidelines (BWRVIP-74) and Appendix A, Demonstration of Compliance with the Technical Information requirements of the License Renewal Rule (10CRF54.21)," letter dated October 18, 2001.

4.7-2 Grimes, C. I. (NRC), to C. Terry (BWRVIP Chairman), "Safety Evaluation for Referencing of BWR Vessel and Internals Project, BWR Core Plate Inspection and Flaw Evaluation Guidelines (BWRVIP-25) Report for Compliance with the License Renewal Rule (10 CFR Part 54) and Appendix B, BWR Core Plate Demonstration of Compliance with the Technical Information Requirements of the License Renewal Rule (10 CFR 54.21)," letter dater December 7, 2000.