LICENSE RENEWAL APPLICATION

PILGRIM NUCLEAR POWER STATION

PREFACE

The following describes the information location, layout, and editorial conventions in the Pilgrim Nuclear Power Station (PNPS) 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* (the license renewal rule) are referred to by the document number, i.e., NUREG-1801 and 10 CFR 54, respectively. References to the UFSAR are to the PNPS 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 the 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 the PNPS 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 PNPS response to 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
AAC	alternate AC
AC	alternating current
ACI	American Concrete Institute
ADS	automatic depressurization system
AEC	Atomic Energy Commission
AEM	Aging effect/mechanism
AISC	American Institute of Steel Construction
AMP	aging management program
AMR	aging management review
ANSI	American National Standards Institute
AOG	augmented off-gas
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
AWWA	American Water Works Association
B&PV	Boiler and Pressure Vessel
BECo	Boston Edison Company
BWR	boiling water reactor
BWRVIP	boiling water reactor vessel and internals program
CAS	compressed air system
CASS	cast austenitic stainless steel
CAV	crack arrest verification
CCW	closed cooling water
CDS	condensate demineralizer system

Abbreviation or Acronym	Description
CE	conducts electricity
CEOG	Combustion Engineering Owners Group
CF	chemistry factor
CFR	Code of Federal Regulations
CLB	current licensing basis
CMAA	Crane Manufacturers Association of America
CO_2	carbon dioxide
CRD	control rod drive
CSCS	core standby cooling systems
CST	condensate storage and transfer
C_VUSE	charpy upper-shelf energy
CW, CWS	circulating water, circulating water system
DBA	design basis accident
DC	direct current
DOR	Division of Operating Reactors
EACS	equipment area cooling system
ECCS	emergency core cooling system
EDG	emergency diesel generator
EFPD	effective full power days
EFPY	effective full power years
EIC	electrical and instrumentation and control
EN	shelter or protection
ENGC	Entergy Nuclear Generation Company
EOL	end of life
EPRI	Electric Power Research Institute
EQ	environmental qualification

Abbreviation or Acronym	**Description**
ER	Applicant's Environmental Report—Operating License Renewal Stage
ESF	engineered safety features
FB	fire barrier
FC	flow control
FD	flow distribution
F_{en}	fatigue life correction factor
FF	fluence factor
FIV	flow-induced vibration
FLB	flood barrier
FLT	filtration
FLV	floodable volume
FP	fire protection
FPC	fuel pool cooling
ft-lb	foot-pound
FW	feedwater
GALL	NUREG-1801, *Generic Aging Lessons Learned Report*
GDC	General Design Criterion
GL	Generic Letter
GRP	gaseous release path
GSI	Generic Safety Issue
H_2	hydrogen
HELB	high-energy line break, HELB shielding
HPCI	high pressure coolant injection
HPSI	high pressure safety injection
HS	heat sink

Abbreviation or Acronym	Description
HT	heat transfer
HVAC	heating, ventilation, and air conditioning
I&C	instrumentation and controls
IAS	instrument air system
IASCC	irradiation-assisted stress corrosion cracking
ID	inside diameter
IGSCC	inter-granular stress corrosion cracking
IN	Information Notice, insulation (electrical)
INEL	Idaho National Engineering Laboratory
INS	insulation
IPA	integrated plant assessment
IR	insulation resistance
ISG	Interim Staff Guidance
ISI	inservice inspection
ISP	Integrated Surveillance Program
ksi	1000 pounds per square inch
KV or kV	kilo-volt
KW	kilo-watt
LOCA	loss of coolant accident
LPCI	low pressure coolant injection
LRA	license renewal application
MB	missile barrier
MeV	mega-electron volt
MIC	microbiologically influenced corrosion

Abbreviation or Acronym	Description
MS	main steam
MSIV	main steam isolation valve
MWe	megawatts-electric
MWt	megawatts-thermal
N_2	nitrogen
NA	neutron absorption
NaOH	sodium hydroxide
n/cm^2	neutrons per square centimeter
NDE	non-destructive examinations
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NPS	nominal pipe size
NRC	Nuclear Regulatory Commission
NSSS	nuclear steam supply system
O_2	oxygen
PASS	post-accident sampling system
PB	pressure boundary
PBO	pressure boundary only
PBOC	pipe breaks outside containment
PFM	probabilistic fracture mechanics
pH	potential hydrogen
PLT	plateout
PNPS	Pilgrim Nuclear Power Station
ppm	parts per million
PSPM	periodic surveillance and preventive maintenance
P-T	pressure-temperature

Abbreviation or Acronym	Description
PTS	pressurized thermal shock
PVC	polyvinyl chloride
PWR	pressurized water reactor
PWSCC	primary water stress corrosion cracking
QA	quality assurance
QAPM	Quality Assurance Program Manual
RBCCW	reactor building closed cooling water
RCIC	reactor core isolation cooling
RCS	reactor coolant system
RHR	residual heat removal
RMS	radiation monitoring system
RPV	reactor pressure vessel
RR, RRS	reactor recirculation, reactor recirculation system
RTD	resistance temperature detector
RV	reactor vessel
RVI	reactor vessel internals
RVID	reactor vessel integrity database
RWCU	reactor water cleanup
SIA	Structural Integrity Associates
SBO	station blackout
SCC	stress corrosion cracking
SDC	shutdown cooling
SE, SER	Safety Evaluation, Safety Evaluation Report
SFP	spent fuel pool
SGTS	standby gas treatment system

Abbreviation or Acronym	**Description**
SLC	standby liquid control
SNS	support for Criterion (a)(2) equipment
SPC	suppression pool cooling
SRE	support for Criterion (a)(3) equipment
SREVS	switchgear room emergency ventilation system
SRV	safety/relief valve
SS	stainless steel
SSC	system, structure, or component
SSR	support for Criterion (a)(1) equipment
SSW	salt service water
STR	structural integrity
TLAA	time-limited aging analysis (analyses)
TBCCW	turbine building closed cooling water
TBS	turbine bypass system
TS	Technical Specifications
TSC	technical support center
TSS	turbine sealing system
UFSAR	Updated Final Safety Analysis Report
UPS	uninterruptible power supply
USAS	USA Standard
USE	upper-shelf energy
UT	ultrasonic testing
1/4 T	one fourth of the way through the vessel wall

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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 Pilgrim Nuclear Power Station (PNPS). The facility operating license (DPR-35) expires at midnight, June 8, 2012. 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 (SRP) for Review for 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 PNPS.

1.1 GENERAL INFORMATION

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

1.1.1 Name of Applicant

Entergy Nuclear Generation Company
Entergy Nuclear Operations, Inc.

1.1.2 Address of Applicant

440 Hamilton Avenue
White Plains, New York 10601

1.1.3 Description of Business of Applicant

Entergy Nuclear Generation Company 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.

1.1.4 Legal Status and Organization

Entergy Nuclear Generation Company, a Massachusetts corporation, is an indirect wholly owned subsidiary of Entergy Corporation. The principal office is located in Plymouth, Massachusetts.

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

Entergy Nuclear Generation Company and Entergy Nuclear Operations, Inc., are not owned, controlled, or dominated by any alien, foreign corporation, or foreign government. Entergy Nuclear Generation Company 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 Generation Company 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 Generation Company 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, TX 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
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, TX 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 Bleakley Avenue & Broadway Buchanon, New York 10511
Randall K. Edington Vice President - Operations Support	Cooper Nuclear Power Station 1200 Prospect Road P.O. Box 98 Brownsville, Nebraska 68321
Christopher J. Schwarz Vice President - Operations Support	Entergy Nuclear Operations, Inc 440 Hamilton Avenue White Plains, New York 10601
Theodore A. Sullivan Vice President - Fitzpatrick Nuclear Power Station	Fitzpatrick Nuclear Power Station 268 Lake Road East Lycoming, New York 13093
Jay K. Thayer Vice President - Vermont Yankee Nuclear Power Station	Entergy Nuclear Vermont Yankee Corporate Office P.O. Box 0500 185 Old Ferry Road Brattleboro, VT 05302-0500

1.1.5 Class and Period of License Sought

Entergy Nuclear Operations, Inc., requests renewal of the facility operating license for PNPS (facility operating license DPR-35) 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, June 8, 2012, to midnight, June 8, 2032.

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

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

1.1.7 Regulatory Agencies with Jurisdiction

Regulatory agencies with jurisdiction over the station are listed below.

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

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

1.1.8 Local News Publications

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

Patriot Ledger
400 Crown Colony Drive
Quincy, MA 02169-0930

Cape Cod Times
319 Main Street
Hyannis, MA 02601

Brockton Enterprise
60 Main Street
P.O. Box 1450
Brockton, MA 02403-1450

Old Colony Memorial
9 Long Pond Road
P.O. Box 362
Plymouth, MA 02360-0959

Duxbury Clipper
P.O. Box 1656
Duxbury, MA 02331-1656

1.1.9 Conforming Changes to Standard Indemnity Agreement

Regulation 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-48) for PNPS states in Article VII that the agreement shall terminate at the time of expiration of the license specified in Item 3 of the attachment to the agreement, which is the last to expire. Item 3 of the attachment to the indemnity agreement, as revised through Amendment No. 12 (effective May 5, 2002), lists PNPS operating license number DPR-35. Entergy Nuclear Operations, Inc. has reviewed the original indemnity agreement and Amendments 1 through 12. Neither Article VII nor Item 3 of the attachment specify an expiration date of license number DPR-35. Therefore, no changes to the indemnity agreement are deemed necessary as part of this application. Should the license number be changed upon issuance of the renewal license, Entergy Nuclear Operations, Inc. requests that conforming changes be made to Item 3 of the attachment, and other sections of the indemnity agreement as appropriate.

1.1.10 Restricted Data Agreement

This application does not contain restricted data or national security information, and Entergy Nuclear Operations, Inc., does not expect that any activity under the renewed license for PNPS will involve such information. However, if such information were to become involved, Entergy Nuclear Operations, Inc., agrees 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 10 CFR Parts 25 or 95.

1.2 PLANT DESCRIPTION

The PNPS site is located on the western shore of Cape Cod Bay in the town of Plymouth, Plymouth County, Massachusetts, and contains approximately 517 acres owned by Entergy Nuclear Generation Company. PNPS employs a General Electric boiling water reactor nuclear steam supply system, initially licensed to generate 1998 megawatts-thermal (MWt). Approval was obtained from the NRC in 2003 to increase the maximum core power level from 1998 MWt to 2028 MWt. This increase corresponds to an output of approximately 690 megawatts-electric (MWe). The current facility operating license for PNPS expires at midnight, June 8, 2012. The principal structures at PNPS include a reactor building, primary containment, radwaste building, intake structure, turbine building, and main stack.

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 PNPS 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 LRA 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 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 flow control or establish a spray pattern.
FD	Flow distribution	Provide flow distribution.
FLB	Flood barrier	Provide protective barrier for internal/external flood events.
FLT	Filtration	Provide filtration.
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
HELB	HELB shielding	Provide shielding against high energy line breaks (HELB).
HS	Heat sink	Provide heat sink during station blackout or design basis accidents.
HT	Heat transfer	Provide heat transfer.
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.

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

Abbreviation	Intended Function	Definition
PB	Pressure boundary	Provide pressure boundary. This function includes maintaining structural integrity and preventing leakage or spray.
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 (a)(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 2.1-4)**,** 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 PNPS followed the recommendations of NEI 95-10.

Consistent with NEI 95-10, the scoping process consisted of developing a list of plant systems and structures and identifying 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 list of systems used for scoping began with a list developed from maintenance rule scoping documents. This list was adjusted based on reviews of plant drawings, the Q list, the PNPS

Updated Final Safety Analysis Report (UFSAR), and other station documents reviewed during scoping.

For mechanical system scoping, system boundaries were determined based on maintenance rule scoping documents, the Q list, plant drawings, and system design basis documents. Although system number codes are used at PNPS in some component identification numbers, the system number in the component identification does not always correspond to the actual system that contains the component. Therefore, PNPS system boundaries are not defined based solely on the system number assigned to components and a system may include components using more than one system code number. This is consistent with the approach used for defining system boundaries in PNPS documents, such as maintenance rule scoping documents and the Q list.

Some system numbers have been used for multiple related systems (e.g., the reactor building and turbine building closed cooling water systems both use the number 30 on piping and instrument drawings (P&IDs)). To simplify administrative control of these systems, their numbers include a letter suffix (e.g., the reactor building and turbine building closed cooling water systems are 30A and 30B, respectively). Although the letter suffix is not included as part of the component identification code, the number and letter combination is used in other system-level plant documentation, such as the Q list. Such systems may be evaluated as a group (e.g., HVAC systems 24A-R) or separately (e.g., system 30A and 30B), based on system function.

As the starting point for structural scoping, a list of plant structures was developed from a review of the UFSAR, the site plan, the master structure list, and the Q list. 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).

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, maintenance rule scoping documents, the Q list, fire hazards analysis and 10 CFR 50 Appendix R safe shutdown analysis, Technical Specifications, system design basis documents, and topical design basis documents for the applicable NRC regulations identified in 10 CFR 54.4(a)(3): 10 CFR 50.48 (FP), 10 CFR 50.49 (EQ), 10 CFR 50.61 (PTS), 10 CFR 50.62 (ATWS) and 10 CFR 50.63 (SBO).

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. In compliance with the requirement of 10 CFR 50, Appendix B to identify structures, systems, and components (SSC) covered by the quality assurance program, PNPS maintains a quality classification list, the PNPS Q list. The Q list identifies safety-related structures, systems, and components and describes the system and structure functions that require classification as safety-related. Systems, components, and structures within the functional ASME Class 1 breaks on drawings listed as references for each system in Section II of the Q list report constitute the list of safety-related components. Specific exclusions are described in Section II. The determination of safety-related systems and structures was based on review of the Q list, supplemented by maintenance rule scoping documentation, the UFSAR, and system design basis documents.

The definition used at PNPS to classify an SSC as safety-related is equivalent to that stated in 10 CFR 54.4. The PNPS definition includes the systems, structures, or components that are relied on to remain functional during or following design basis events to

i. maintain the integrity of the reactor coolant pressure boundary,

ii. achieve and maintain safe shutdown of the reactor following a postulated accident, or

iii. prevent or mitigate the consequences of postulated accidents which could result in off-site exposures comparable to the guidelines of 10 CFR 100.

This is the same as 10 CFR 54.4 except that only 10 CFR 100 is cited for dose guidelines. 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). These guidelines, applicable to facilities seeking a construction permit or facilities which have revised the current accident source term used in their design basis radiological analyses, respectively, are not applicable to PNPS.

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 2.1-4). 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 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 Functional Failures of Nonsafety-Related SSCs

At PNPS, 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. Engineering and licensing documents (UFSAR, maintenance rule scoping documents, and design basis documents) were reviewed to identify exceptions. The only exceptions are systems with components in the main condenser and MSIV leakage pathway, which are credited for hold-up and plate-out functions to reduce off-site doses as described in Section 2.3.4.

2.1.1.2.2 Physical Failures of Nonsafety-Related SSCs

Based on the license renewal rule and the guidance in Reference 2.1-4, 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

At PNPS, certain components and piping outside of the safety class pressure boundary must be structurally sound in order to maintain the pressure boundary integrity of safety class piping. These components perform a structural support 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 PNPS, the "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. For nonsafety-related SSCs directly connected to safety-related SSCs (typically piping and HVAC ductwork), the nonsafety-related piping or ductwork and the supports in the structural boundary are subject to aging management review based on the intended function of criterion10 CFR 54.4(a)(2).

(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,
- 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 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 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 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 topical design basis document. PNPS 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.

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.

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.

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 establish this scope of equipment, a detailed review of the PNPS 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)

Regulation 10 CFR 50.49 defines electric equipment important to safety that is required to be environmentally qualified to mitigate certain accidents that result in harsh environmental conditions in the plant. Regulation 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 PNPS 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 rule concerning pressurized thermal shock (PTS), 10 CFR 50.61, requires that licensees evaluate the PWR reactor vessel beltline materials against specific criteria to ensure protection from brittle fracture. As a boiling water reactor, PNPS 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 PNPS 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 requires that each light-water-cooled nuclear power plant be able to withstand and recover from a station blackout. A station blackout (SBO) is the loss of offsite and onsite 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. 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.

PNPS has installed a blackout alternate AC (AAC) power source consisting of a diesel generator that meets the independence, performance, and configuration criteria of Regulatory Guide 1.155 (Reference 2.1-9). The blackout diesel generator can be manually started within 10 minutes after a station blackout has occurred and used to power critical loads.

Based on NRC guidance in NUREG-1800 (Reference 2.1-2), 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).

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 2.1-4) 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 PNPS 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 are 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 passive components that perform or support an intended function without moving parts or a change in configuration or properties 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.

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.

Functional failures of nonsafety-related SSCs which could impact a safety function were identified only for those systems with components supporting the main condenser and MSIV leakage pathway. Screening for these components consisted of identifying the passive, long-lived components in the main condenser and MSIV leakage pathway. Components supporting this intended function that are subject to aging management review are described in Section 2.3.4, Steam and Power Conversion Systems.

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.

Screening for components with the potential for spatial interaction is discussed below. These components were identified first. Then portions of systems identified as not requiring review for spatial effects were evaluated to determine if nonsafety-related components required review for their structural support function. Appropriate drawings for the systems not included for spatial effects were reviewed to identify safety/nonsafety interfaces. Nonsafety-related piping systems connected to safety-related systems were included to a point that includes an adequate portion of the nonsafety-related piping run to conservatively include the first seismic or equivalent anchor. An equivalent anchor is a combination of hardware or structures that together are equivalent to a seismic anchor. A seismic anchor is defined as hardware or structures that, as required by the analysis, physically restrain forces and moments in three orthogonal directions. The physical arrangement as analyzed insures that the stresses that are developed in the safety-related piping and supports are within the applicable piping and structural code acceptance limits. This approach included piping beyond the safety/nonsafety interface up to a base-mounted component, flexible connection, or the end of a piping run (such as a drain line). This is consistent with the guidance in NEI 95-10, Appendix F.

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

The term HELB (high energy line break) envelopes breaks both inside and outside containment (pipe breaks outside containment-PBOC). By general practice, PNPS uses the term HELB in the radiological analyses of breaks outside containment, and PBOC in the fluid dynamics analyses. These analyses were reviewed to identify system components in spaces such that the criterion of 10 CFR 54.4(a)(2) was applicable.

High energy lines are defined as piping containing fluid at a temperature above 200°F coincident with a pressure above 275 psig during normal operation. Implementation of the 200°F/275 psig criteria to PNPS resulted in the identification of the following systems for PBOC analysis.

- main steam
- feedwater
- reactor core isolation cooling
- high pressure coolant injection
- reactor water cleanup
- sampling

Many of these high energy lines are safety-related lines that are included in the system mechanical aging management reviews. No further review of these components for 10 CFR 54.4(a)(2) was necessary.

During the review of the PNPS systems, these high energy systems were reviewed 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 PNPS, 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). All components in these mechanical systems, with the exception of those identified in Table 2.3.3.14-B, are subject to aging management review. 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. The 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 constitute 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
- elastomers
- earthen structures
- flouropolymers and lubrite sliding surfaces

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 as 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-3100, 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 excludes 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 mechanical or 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 2.1-4) 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 PNPS electrical commodity groups were identified and crossreferenced 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 2.4.6).

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, or replaced. Fire protection at PNPS complies with the applicable safety standards (NFPA-10 for fire extinguishers; NFPA-1962 for fire hoses; 29 CFR 19.10, 29 CFR 19.26, 42 CFR 84, NUREG/CR-0041, and ANSI-Z88.2 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 AMR.

2.1.3 Interim Staff Guidance Discussion

As discussed in NEI 95-10 (Reference 2.1-4), 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 9, 19B, and 23, these ISGs have been closed (Reference 2.1-5, Reference

2.1-6). 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 PNPS.

The remaining ISGs are discussed below.

ISG-9 *Identification and Treatment of Structures, Systems and Components Which Meet 10 CFR 54.4(a)(2)*

10 CFR 54.4(a)(2) states that SSCs within the scope of license renewal shall include nonsafety-related SSCs whose failure could prevent the satisfactory accomplishment of any of the functions identified for safety-related SSCs.

The process used to identify the in-scope nonsafety-related SSCs under 10 CFR 54.4(a)(2), discussed in Section 2.1.1.2, is consistent with the guidance provided in NEI 95-10 Appendix F (Reference 2.1-4), which has been endorsed by the NRC in RG 1.188.

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

At PNPS a review for replacement parts necessary to meet 10 CFR 50.48 did not identify any replacement or spare components required to be installed following a fire.

2.1.4 Generic Safety Issues

In accordance with the guidance in NEI 95-10, review of NRC generic safety issues 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 2.1-3), the following GSIs are to be addressed in this application.

GSI 168 *Environmental Qualification of Electrical Equipment*

This GSI was resolved with no new requirements for licensees (Reference 2.1-7). 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 PNPS and addressed in Section 4.4.

GSI 190 <u>Fatigue Evaluation of Metal Components for 60-Year Plant Life</u>

This GSI addresses fatigue life of metal components and was closed by the NRC (Reference 2.1-8). 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 PNPS 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. Nuclear Regulatory Commission, NUREG-0933, *A Prioritization of Generic Safety Issues*, Supplement 28, August 2004.

2.1-4 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.

2.1-5 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.

2.1-6 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.

2.1-7 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.

2.1-8 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.

2.1-9 U.S. Nuclear Regulatory Commission, Regulatory Guide 1.155, “Station Blackout,” dated 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 PNPS. 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 maintenance rule scoping documents, the Q list, plant drawings, the UFSAR, and system design basis documents reviewed during scoping. 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 the UFSAR, site plan, master structure list, and the Q list. 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
27	Circulating Water	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
31, 32, 40	Compressed Air	Section 2.3.3.8, Compressed Air (Instrument Air)
18	Condensate	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
20A, 35, 36, 43	Condensate Demineralizers	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
26, 21	Condensate Storage and Transfer	Section 2.3.4.1, Condensate Storage System
3	Control Rod Drive	Section 2.3.1, Reactor Coolant System
14	Core Spray	Section 2.3.2.2, Core Spray System
61, 40A, 37, 47 (EDG components)	Emergency Diesel Generator	Section 2.3.3.4, Emergency Diesel Generator
16	Extraction Steam	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
6, 37 (FW components)	Feedwater	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
17	Feedwater Heater Drains and Vents	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
33, 70	Fire Protection	Section 2.3.3.9, Fire Protection—Water Section 2.3.3.10, Fire Protection—Halon
38	Fuel Oil Storage and Transfer	Section 2.3.3.7, Fuel Oil
19, 49, 56	Fuel Pool Cooling and Demineralizer	Section 2.3.3.13, Fuel Pool Cooling and Fuel Handling and Storage Systems
24A-T	Heating, Ventilation and Air Conditioning	Section 2.3.3.11, Heating, Ventilation and Air Conditioning

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

System Number	System Name	LRA Section
23	High Pressure Coolant Injection	Section 2.3.2.4, High Pressure Coolant Injection
52A, 25	Main Condenser	Section 2.3.4.4, Main Condenser
1	Main Steam	Section 2.3.4.2, Main Steam
8, 15, 52B-D	Offgas and Augmented Offgas	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
49, 65, 67, 09C	Post-Accident Sampling	Section 2.3.3.12, Primary Containment Atmosphere Control
34	Potable and Sanitary Water	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
9, 45	Primary Containment Atmospheric Control	Section 2.3.3.12, Primary Containment Atmosphere Control
50	Primary Containment System	Section 2.3.3.12, Primary Containment Atmosphere Control
20B-L	Radioactive Waste	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
30A	Reactor Building Closed Cooling Water	Section 2.3.3.3, Reactor Building Closed Cooling Water
13	Reactor Core Isolation Cooling	Section 2.3.2.5, Reactor Core Isolation Cooling
2, 4, 49A, 54	Reactor Coolant System	Section 2.3.1, Reactor Coolant System
12	Reactor Water Cleanup	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
10	Residual Heat Removal	Section 2.3.2.1, Residual Heat Removal System
29	Salt Service Water	Section 2.3.3.2, Salt Service Water
4, 66, 71	Sampling	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
41, 39	Sanitary Soiled Waste and Vent, Plumbing and Drains	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
28	Screen Wash	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
63	Security	Section 2.3.3.6, Security Diesel
48, 44, 45, 34	Standby Gas Treatment	Section 2.3.2.6, Standby Gas Treatment
11	Standby Liquid Control	Section 2.3.3.1, Standby Liquid Control
37, 47, 61, 76 (SBO DG components)	Station Blackout Diesel Generator	Section 2.3.3.5, Station Blackout Diesel Generator System
30B	Turbine Building Closed Cooling Water	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
51, 7, 15, 37	Turbine Generator and Aux.	Section 2.3.4.3, Turbine-Generator and Auxiliaries

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 (ATWS is described in Section 3.9). 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
*	Auxiliary Power Distribution System
*	ATWS (Recirculation Pump Trip, ARI, Feedwater Pump Trip)
42	Communications
*	Core Standby Cooling Systems Control and Instrumentation
46K	Emergency Power System
46D	Excitation
46C	Generation
46J	Instrument AC Power
45M	Jet Pump Instrumentation
45L	Miscellaneous Instrumentation
46F	Motor - 4 KV, 480 V
45A	Neutron Monitoring
45H	Plant Computer
45BC	Primary Containment Isolation
45E	Process Radiation Monitor & Area Radiation Monitor
80	Radiological Information Management System

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

System Number	System Name
*	Reactor Building Isolation and Control
45I	Reactor Level Control
45D	Reactor Manual Control and CRD
45C	Nuclear Boiler Instrumentation
45B	Reactor Protection
45F	Reactor Recirculation Control & Jet Pump
*	Refueling Interlocks
45G	Rod Worth Minimizer
46G	Station DC and Battery
5	Station Lighting
46E	Switchgear - 4 KV, 480 V, MCC
46B	Transformers - Main, Unit Auxiliary, Startup and Shutdown
46A	Transmission and Switchyard
46L	TSC UPS and Security UPS
45K	Turbine Generator Protection

* This system has no unique system number but is included for completeness. It is part of other mechanical or electrical systems.

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

System Number	System	UFSAR Reference
22	Hydrogen Gas Storage	Section 10.21
73, 74, 78, 79, 68, 69	Electrolytic Hydrogen Water Chemistry	Section 10.21 and 10.22

Table 2.2-3
Structures within the Scope of License Renewal

Structure Name	LRA Section
Blackout Emergency Diesel Generator Building	Section 2.4.5, Yard Structures
Breakwaters, Jetties and Revetments	Section 2.4.5, Yard Structures
Condensate Storage Tank Foundations	Section 2.4.5, Yard Structures
Cranes and Hoists	Section 2.4.2, Reactor Building Section 2.4.3, Intake Structure Section 2.4.4, Process Facilities
Discharge Structure and Channel	Section 2.4.5, Yard Structures
Emergency Diesel Generator Building	Section 2.4.4, Process Facilities
Fire Water Storage Tank Foundations	Section 2.4.5, Yard Structures
Fuel Handling and Storage	Section 2.4.2, Reactor Building
Intake Structure	Section 2.4.3, Intake Structure
Main Stack and Filter Building	Section 2.4.4, Process Facilities
Primary Containment	Section 2.4.1, Primary Containment
Radwaste Building	Section 2.4.4, Process Facilities
Reactor Building	Section 2.4.2, Reactor Building
Security Diesel Generator Building	Section 2.4.5, Yard Structures
Switchyard	Section 2.4.5, Yard Structures
Switchyard Relay House	Section 2.4.5, Yard Structures
Transformer Foundation	Section 2.4.5, Yard Structures
Trenches, Valve Pits, Manholes and Duct Banks	Section 2.4.5, Yard Structures
Turbine Building	Section 2.4.4, Process Facilities
Underground Fuel Oil Tanks Foundations	Section 2.4.5, Yard Structures

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

Structure Name	UFSAR Reference or Function
Backup Meteorological Tower	Section 2.3.2
BECo Office and Warehouse	Provides office and warehouse space for plant stores and personnel
Central Alarm Station	Provides space for and protect plant security alarm equipment.
Contractor Gate House	Serves as a work/maintenance area during outages
Contractor Office / Warehouse / Shops	Provides space for maintenance and outage work.
Decontamination Facility	Provides space for decontamination of tools and equipment and working space for handling trash, metals, wood, and potential HAZMAT being transferred to the trash compacting facility.
Demineralized Water Tank Foundation	Supports the demineralized water tank, which is not within scope of license renewal.
Emergency Operations Facility	Provides off-site, central facility for the evaluation and coordination of licensee activities in response to an emergency.
Engineering and Plant Support Building	Provides office space for engineering and other support activities.
Executive Building	Section 12.2.2.6.1
Firewater Pump House	Supports and protects a diesel fire pump and associated equipment that has been abandoned in place and is not in the scope of license renewal.
Fitness for Duty Building	Provides a medical and access authorization facility (located outside the protected area).
Gas Bottle Storage Facility	Section 12.2. Used for temporarily storing bottles.
Gate House	Section 12.2
Hydrogen Generation Building	Section 10.22.3. Used for temporarily storing bottles.

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

Structure Name	UFSAR Reference or Function
Hydrogen Storage Pad	Section 10.21. Used for supporting hydrogen tank not within the scope of license renewal.
Indoctrination and Support Building	Serves as an instrument calibration facility and an exercise area (located outside the protected area).
Liquid Nitrogen Tank Foundation	Provides support for the liquid nitrogen tank and its associated equipment not within the scope of license renewal.
Low Level Radwaste Facility	Provides space and equipment to process and store low-level radioactive waste generated at the site. It does not house any system or component within scope of license renewal.
Off Gas Retention Building	Section 9.4.4
Oil Storage House	Prefabricated steel oil storage structure with an integral sump.
Operations and Maintenance Building	Section 12.2.2.6.2 (new administration/service building)
Oxygen Storage Facility	Section 10.21. Used for storing oxygen bottles for welding.
Primary Meteorological Tower	Section 2.3.2
Retube Building	Used for storage
Sewage Treatment Facility	Houses sewage treatment system equipment
Sludge Dewatering Facility	Provides secondary sewage processing.
Trash Compacting Facility	Section 12.2

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

2.3.1 Reactor Coolant System

System Description

The purpose of the reactor coolant system (RCS) is to house the reactor core and to contain and transport the fluids coming from or going to the reactor core. The RCS includes the reactor vessel and internals, the reactor recirculation system, and the control rod drive system. Two similar recirculation loops connect in parallel to the reactor vessel. Each loop contains one recirculation outlet leg, one recirculation inlet manifold, and one recirculation pump.

Reactor Vessel and Internals

The reactor vessel, a primary pressure vessel with a bolted head, is comprised of a shell, a removable top head, an integrally welded bottom head, flanges and bolting, multiple nozzles and safe-ends, control rod drive penetrations, instrument penetrations, head-to-flange bolting, and a support skirt. The reactor vessel and appurtenances includes ASME Class 1 piping attached to the reactor vessel. (See also Section 2.3.1.1.)

The reactor vessel internals distribute the flow of coolant delivered to the vessel, locate and support the fuel assemblies, and provide an inner volume containing the core that can be flooded following a break in the nuclear system process barrier external to the reactor vessel. Seismic Class I piping provides an injection path for the standby liquid control system. (See also Section 2.3.1.2.)

Reactor Recirculation

The reactor recirculation system (RRS) provides variable forced circulation through the reactor core to vary reactor power and maintain normal operating temperature by supplying sufficient subcooled water to the core.

The reactor recirculation system consists of two external recirculation loops, each containing a recirculation pump with suction and discharge valves, which provide the driving flow of water to the reactor vessel jet pumps. Each recirculation loop supplies ten jet pumps. A portion of RRS piping provides a closed return path for LPCI to the jet pump nozzles to ensure that the vessel is reflooded following a DBA. The system includes containment isolation valves for a sample line and for instrument lines. Recirculation pump components are cooled by reactor building closed cooling water (RBCCW) and have a safety function to maintain the RBCCW pressure boundary.

Control Rod Drive

The control rod drive (CRD) system permits core reactivity control by positioning control rods during power operation using individual control rod drive mechanisms. The CRD system provides the means to adjust core reactivity (for power level control and power shaping) by incremental positioning of individual rods in the core. When transient or accident conditions require rapid shutdown of the reactor (scram), the CRD system inserts all rods into the core quickly enough to avoid fuel damage.

The control rod drive system is divided into two subsystems: CRDH (control rod drive hydraulic) and CRDM (control rod drive mechanism). CRDH consists of the hydraulic system (fluid transmission), hydraulic control units, scram discharge instrument volumes, and the CRD air supply, which includes the scram pilot valve air header (SPVAH). The CRDH system supplies and controls clean high pressure water to control rod drive mechanisms for cooling and positioning control rods (normal drive means and scram). CRDM consists of the control rods and control rod drive mechanisms. The control rod drive mechanisms form part of the reactor coolant system pressure boundary.

RBCCW cools CRD system components. This cooling function is not required for the CRD system to perform its safety function; however, the coolers have the safety function of maintaining the RBCCW system pressure boundary.

The CRD system is credited for mitigation of ATWS events. The CRD system air supply includes two alternate rod insertion (ARI) valves that are redundant to the existing RPS backup scram valves. When either valve is energized, the scram valve air supply header is vented to atmosphere to initiate insertion of all control rods.

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

- Maintain integrity of the reactor coolant pressure boundary.
- Support primary containment isolation.
- Maintain reactor fuel limits and core bypass region cooling, moderation and instrumentation functions.
- Maintain core geometry.
- Support SLC injection.
- Support LPCI flowpath.
- Maintain RBCCW pressure boundary.

The reactor vessel and internals and RRS have the following intended function for 10 CFR 54.4(a)(2).

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

The reactor vessel and internals and RRS have the following intended function for 10 CFR 54.4(a)(3).

- The RCS is credited in the10 CFR 50 Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

The CRD 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.
- Maintain RBCCW pressure boundary.

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

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

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

- Shut down the reactor when required by transient or accident conditions as credited for fire protection regulations (10 CFR 50.48).
- Provide ARI during an ATWS event (10 CFR 50.62).

<u>UFSAR References</u>

Section 3.3 discusses the reactor vessel internals. Sections 4.2 and 4.3 discuss reactor vessel and appurtenances and the reactor recirculation system. Section 3.4 discusses the control rod drives and the ARI is discussed in Section 3.9.

<u>Components Subject to AMR</u>

The reactor coolant system includes those systems and components that form the major portions of the nuclear system process barrier. These systems and components contain, or transport the fluids coming from, or going to the reactor core. The reactor coolant system includes the reactor vessel and reactor vessel internals. The reactor coolant system includes the following systems in their entirety: nuclear boiler, nuclear boiler instrumentation, reactor recirculation and control rod drive (hydraulic and mechanisms).

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, RHR)
- core spray system (Section 2.3.2.2, CS)
- automatic depressurization system (Section 2.3.2.3, ADS)
- high pressure coolant injection system (Section 2.3.2.4, HPCI)
- reactor core isolation cooling system (Section 2.3.2.5, RCIC)
- standby liquid control system (Section 2.3.3.1, SLC)
- post-accident sampling (Section 2.3.3.12, PCAC)
- feedwater (Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2))
- reactor water cleanup (Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2))
- main steam (Section 2.3.4.2, Main Steam)

PNPS does not have an isolation condenser.

Fuel assemblies are not subject to aging management review because they are replaced after a limited number of cycles. Control rods are not subject to aging management review as they accomplish their intended function with a change in configuration.

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

- components required to maintain RBCCW system pressure boundary (Section 2.3.3.3, Reactor Building Closed Cooling Water)
- portions of the system that provide an extension of the primary containment (Section 2.3.2.7, Primary Containment Penetrations).
- nonsafety-related components whose failure could prevent satisfactory accomplishment of safety functions (Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)).

The following non-ASME Class 1 components of the CRD system are reviewed as referenced.

- components supplied by instrument air (Section 2.3.3.8, Compressed Air (Instrument Air))
- components required to maintain RBCCW pressure boundary (Section 2.3.3.3, Reactor Building Closed Cooling Water)
- nonsafety-related components whose failure could prevent satisfactory accomplishment of safety functions (Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)).

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 (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-M-239 Sheet 2	LRA-M-247	LRA-M-252 Sheet 2
LRA-M-241 Sheet 1	LRA-M-249	LRA-M-253 Sheet 1
LRA-M-242	LRA-M-250 Sheet 1	LRA-M-253 Sheet 2
LRA-M-243	LRA-M-250 Sheet 2	
LRA-M-245	LRA-M-252 Sheet 1	

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, bottom head, and 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 and the interface flanges for bolted connections. Thermal sleeves attached to vessel nozzles or nozzle safe ends are included as are control rod drive stub tubes, control rod drive housings, and incore housings. The vessel support skirt, vessel interior welded attachments, and vessel exterior welded 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 designed to distribute the reactor coolant flow 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.

The reactor vessel internals include the control rod guide tubes, core plate, core spray lines, differential pressure and standby liquid control line, feedwater spargers, fuel support pieces, incore dry tubes, incore guide tubes, local power range monitors (LPRM), jet pump assemblies and jet pump instrumentation, shroud (including repair hardware), shroud head and steam separator assembly, shroud support, steam dryer, surveillance sample holders, and top guide.

Table 2.3.1-2 lists the mechanical components subject to aging management review and component intended functions for the reactor vessel internals. The steam dryer is conservatively subject to aging management review based on NRC guidance.

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 reactor coolant pressure boundary (RCPB) provides and maintains a high integrity pressure boundary and fission product barrier inside primary containment and out to the first isolation valve outside primary containment.

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 this review include those pressure-containing fluid components which are (1) part of the reactor coolant system, or (2) connected to the reactor coolant system, up to and including any or all of the following.

- Outboard containment isolation valves on system piping which penetrates primary reactor containment and has an outboard isolation valve. For the main steam and feedwater piping, this extends to the Class 1 boundary at the reactor building wall.

- Class 1 boundary for piping which does not penetrate the containment. On vent, drain, and test connections this is usually the first normally closed isolation valve. If no Class 1 boundary is specified, this extends either to the end of the line, until another aging management review covers the piping, or until the piping no longer serves a license renewal intended function.

- Reactor coolant system safety and relief valves up to the 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
Bolting	
Closure flange studs, nuts, washers and bushings.	Pressure boundary
Incore housing bolting • Flange • Flange bolts • Nut and washer	Pressure boundary
Other pressure boundary bolting • Upper head flange bolts and nuts • CRD flange bolting	Pressure boundary
Heads and Shell	
Dome • Bottom head • Upper closure head	Pressure boundary
Flanges • Shell closure flange • Upper head closure flange	Pressure boundary
Vessel shell • Beltline shell • Intermediate nozzle shell • Lower shell • Upper shell	Pressure boundary
Nozzles and Penetrations	
CRD housings	Pressure boundary
CRD stub tubes	Pressure boundary
In-core housings	Pressure boundary
Nozzles	Pressure boundary
Safe Ends, Thermal Sleeves, Caps and Flanges	
Cap • CRD return (N10)	Pressure boundary
Flanges	Pressure boundary
Safe ends	Pressure boundary

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

Component Type	Intended Function
Thermal sleeves	Pressure boundary
Vessel Attachments and Supports	
ID attachment welds	Pressure boundary
ID attachments • Shroud support pad	Support for Criterion (a)(1) equipment
Supports • Stabilizer pads • Support skirt	Support for Criterion (a)(1) equipment

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

Component Type	Intended Function
Control rod guide tubes	Support for Criterion (a)(1) equipment
Core plate assembly	Support for Criterion (a)(1) equipment
Core spray lines	Flow distribution
SLC/ΔP line	Flow distribution
Fuel support pieces	Support for Criterion (a)(1) equipment
Incore dry tubes	Pressure boundary
Incore guide tubes	Support for Criterion (a)(1) equipment
Jet pump assemblies	Floodable volume
Shroud	Floodable volume
Shroud repair hardware	Support for Criterion (a)(1) equipment
Shroud support	Support for Criterion (a)(1) equipment
Steam dryer	Structural integrity
Top guide	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 (flanges, valves, etc.)	Pressure boundary
Condensing chambers	Pressure boundary
Detector (CRD)	Pressure boundary
Drive (CRD)	Pressure boundary
Driver mount (RR)	Pressure boundary
Filter housing (CRD)	Pressure boundary
Flow elements (RR)	Pressure boundary
Orifices (Instrumentation)	Pressure boundary
Piping and fittings < 4” NPS	Pressure boundary
Piping and fittings ≥ 4” NPS	Pressure boundary
Pump casing and cover (RR)	Pressure boundary
Pump cover thermal barrier (RR)	Pressure boundary
Restrictors (MS)	Flow control
Rupture disc (CRD)	Pressure boundary
Tank (CRD accumulator)	Pressure boundary
Thermowell (all systems)	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 included in this section.

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

2.3.2.1 Residual Heat Removal System

System Description

The purpose of the residual heat removal (RHR) system is to provide core cooling, in conjunction with other core standby cooling systems (CSCS), and to provide containment cooling as required during abnormal operational transients and postulated accidents.

The RHR system consists of two heat exchangers, four main system pumps, and associated valves and piping. The heat exchangers (tube side) are cooled by the reactor building closed cooling water system, which is in turn cooled by the station salt service water system. Portions of the RHR system provide an extension of the reactor coolant pressure boundary. Portions of this system provide an extension of primary containment.

The RHR system is designed for four modes of operation.

Shutdown cooling (SDC) mode

The SDC mode of operation completes cooldown of the nuclear system when nuclear system pressure has decreased such that steam supply pressure is no longer sufficient to maintain vacuum in the main condenser. Reactor coolant is circulated from the reactor recirculation suction piping, through the RHR heat exchangers, and back to the vessel through the reactor recirculation system discharge piping.

Low pressure coolant injection (LPCI) mode

In LPCI mode, RHR operates in combination with other CSCS to restore and, if necessary, maintain the coolant inventory in the reactor vessel after a LOCA. RHR pumps circulate water from the suppression pool and discharge into the reactor vessel core region through one of the recirculation loops.

Suppression pool cooling (SPC) mode

RHR is placed in the SPC mode of operation to remove heat from the pressure suppression pool to reduce pressure in primary containment following a LOCA. RHR pumps circulate water from the suppression pool through the RHR heat exchanger and back to the suppression pool, discharging under water.

Containment spray mode

The containment spray mode of operation provides containment spray capability as an alternate method for reducing containment pressure following a LOCA. A portion of the water pumped through the RHR heat exchanger can be diverted to spray headers in the drywell and above the suppression pool to condense steam and lower containment pressure. The remaining portion of the water not used for the spray function returns to the suppression pool.

RHR may be used to augment the fuel pool cooling and demineralizer system if not needed for the above functions. This capability increases the spent fuel pool cooling capacity in the event that such additional capacity is necessitated by removal of the full reactor core or a large number of fuel assemblies during a normal refueling. The RHR system using the suppression pool provides a safety-related source of makeup water to the spent fuel pool.

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

- Provide for the injection of makeup water following any loss of reactor coolant such that no fuel or clad damage will occur (LPCI mode).
- Remove fission product decay heat and other residual heat from the reactor core at a rate such that specified acceptable fuel design limits and the design conditions of the reactor coolant pressure boundary are not exceeded (SPC mode).
- Reduce rapidly, consistent with the functioning of other associated systems, the containment pressure and temperature following any loss of coolant accident and maintain them at acceptably low levels (SPC and containment spray mode).
- Provide makeup water to the spent fuel pool.
- Support primary containment isolation.
- Maintain reactor coolant system pressure boundary integrity.

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

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

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

- RHR is credited in the 10 CFR 50 Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Section 4.8, 10.3 (makeup to fuel pool)

Components Subject to AMR

ASME Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed with the RCS (Section 2.3.1). Instrument tubing and valves downstream of penetrations X-15G, X-28D, X-106AC and X-106AF are included with primary containment penetrations (Section 2.3.2.7). 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). 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-M-212 Sheet 1	LRA-M-239 Sheet 2
LRA-M-215 Sheet 2	LRA-M-241 Sheet 1
LRA-M-215 Sheet 4	LRA-M-241 Sheet 2
LRA-M-239 Sheet 1	

2.3.2.2 Core Spray System

System Description

The purpose of the core spray (CS) system, in conjunction with other core standby cooling systems (CSCS), is to provide adequate core cooling for all design basis break sizes up to and including a double-ended break of the reactor recirculation system piping. The core spray system provides protection of the core for the large break in the nuclear system when the feedwater system, control rod drive water pumps, RCIC, and the HPCI are unable to maintain reactor vessel water level. The protection also extends to a small break in which the feedwater system, control rod drive water pumps, RCIC, and HPCI are all unable to maintain the reactor vessel water level and the automatic depressurization system has operated to lower the reactor vessel pressure so LPCI and the core spray system can provide core cooling.

The CS system consists of two loops of motor driven pumps and associated valves and piping to deliver makeup water to the sparger ring in the reactor vessel.

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

- Provide injection of makeup water following any loss of reactor coolant.
- Maintain integrity of reactor coolant pressure boundary.
- Support primary containment isolation.

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

- The CS system is credited in the 10 CFR 50 Appendix R safe shutdown capability analysis (10 CFR 50.48).

UFSAR References

Section 6.4.3

Components Subject to AMR

CSCS suction strainers located in the suppression pool are used by both the RHR and CS systems and are included in the RHR system aging management review (Section 2.3.2.1). 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 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-M-215 Sheet 2	LRA-M-242
LRA-M-215 Sheet 4	
LRA-M-241 Sheet 1	

2.3.2.3 Automatic Depressurization

System Description

The automatic depressurization system (ADS), part of the core standby cooling systems (CSCS), is a subsystem of the main steam system (system number 1). For a complete description of main steam, see Section 2.3.4.2.

The purpose of ADS is to reduce the nuclear system pressure so that the low pressure core cooling systems can reflood the core following certain postulated transients or accidents. ADS uses the four nuclear system pressure relief valves (safety relief valves) to relieve the high pressure steam to the suppression pool.

The safety relief valves are installed so that each valve discharge is piped through its own uniform diameter discharge line to a point below the minimum water level in the primary containment suppression pool to permit the steam to condense in the pool. Water in the line above suppression pool water level would cause excessive pressure on relief valve discharge piping when the valve again opened. For this reason, vacuum relief valves are provided on each relief valve discharge line to prevent drawing water up into the line due to steam condensation following termination of relief valve operation. The safety relief valves are located on main steam piping. Each of the four safety relief valves is equipped with an air/nitrogen accumulator and check valve arrangement. These accumulators are provided to assure that the valves can be held open following failure of the air or nitrogen supply to the accumulators.

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

- Provide automatic nuclear system depressurization for small breaks in the nuclear system so that the low pressure coolant injection and core spray systems can operate to protect the fuel barrier.
- Provide a manually initiated nuclear system depressurization for postulated transients and accidents in which the main heat sink is unavailable.

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

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

- ADS is credited in the 10 CFR 50 Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Sections 4.4 (part of the nuclear system pressure relief system) and 6.4.2

Components Subject to AMR

The components included in this evaluation are those required to maintain the discharge tailpipe and vacuum breaker pressure boundary of the ADS. The boundary begins at the outlet of the four pressure relief valves (RV-203-3A, B, C, and D) and includes the discharge piping, fittings, vacuum breaker valves, and tee-quencher discharge in the torus.

Instrument air and nitrogen supply components are included with the instrument air system evaluation (Section 2.3.3.8). The pressure relief valves themselves 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-M-252 Sheets 1 and 2

2.3.2.4 High Pressure Coolant Injection

System Description

The purpose of the high pressure coolant injection (HPCI) system, part of the core standby cooling systems (CSCS), is to provide adequate cooling of the reactor core under abnormal, transient, and postulated accident conditions, including a loss of coolant accident (LOCA). The HPCI system provides and maintains an adequate coolant inventory in the reactor pressure vessel in the event of a small break in the nuclear system and loss of coolant which does not result in rapid depressurization of the reactor vessel. The system is designed to accomplish its function on a short-term basis without reliance on station auxiliary power supplies other than the DC power supply.

The HPCI system consists of a turbine-driven pump, a gland seal condenser, and associated piping and valves. The turbine, supplied with reactor steam and exhausting to the torus, drives a pump assembly, consisting of a main pump, reducing station and booster pump. The pump suction header is supplied with water from the condensate storage tanks (preferred path) or the torus suppression pool (assured path). HPCI injection to the vessel occurs through a feedwater line.

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

- Provide injection of makeup water following a loss of reactor coolant.
- Assist in reducing reactor coolant system pressure. Using reactor steam for turbine operation accomplishes this function.
- Support primary containment isolation.
- Maintain integrity of reactor coolant pressure boundary.

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

- The system is credited in the 10 CFR 50 Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Section 6

Components Subject to AMR

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 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-M-241 Sheet 1	LRA-M-244 Sheets 1 and 2
LRA-M-243	LRA-M-227 Sheet 1

2.3.2.5 Reactor Core Isolation Cooling

System Description

The purpose of the reactor core isolation cooling (RCIC) system is to provide makeup water to the reactor vessel during shutdown and isolation to supplement or replace the normal makeup sources. The system provides makeup water to the reactor vessel following reactor vessel isolation to prevent the release of radioactive materials to the environs as a result of inadequate core cooling. The RCIC system operates completely independent of AC power and its capability, in conjunction with that of other level control systems, allows for complete plant shutdown following the loss of normal feedwater by maintaining sufficient reactor inventory until the reactor is depressurized and the shutdown cooling system placed in operation.

The RCIC system consists of a steam turbine-driven pump, a barometric condenser for steam seal leakage, and associated piping and valves. The system is designed to supply water from the condensate storage tank or the suppression pool to the vessel via a feedwater line. It utilizes reactor steam to drive the turbine, which is exhausted into the suppression pool. Portions of this system provide an extension of the primary containment. Portions of this system form part of the reactor coolant pressure boundary.

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

- Provide makeup water to the reactor vessel to assure that adequate core cooling takes place in the event of reactor isolation.
- Support primary containment isolation.
- Maintain reactor coolant system pressure boundary integrity.

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

- RCIC is credited in the 10 CFR 50 Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Section 4.7

Components Subject to AMR

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 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-M-241 Sheet 1
LRA-M-245
LRA-M-246 Sheets 1 and 2

2.3.2.6 Standby Gas Treatment

System Description

The purpose of the standby gas treatment system (SGTS) is to limit the release of radioactive materials to the environs so that offsite doses from a postulated DBA will be below the guideline values of 10 CFR 100. The standby gas treatment system is part of the secondary containment system (SCS), which provides secondary containment for the postulated LOCA and primary containment for the postulated refueling accident.

The SGTS consists of two full-capacity trains containing dampers, an exhaust fan, and an air filtration assembly. The SGTS shares ducting with the various reactor building exhaust systems and has the ability to draw air from the reactor building clean and contaminated compartment exhausts, the refueling floor exhaust, and the drywell and suppression pool exhausts.

After treatment, the air is discharged through an underground line to the main stack. This line is part of the underground vent duct system. The purpose of the underground vent duct is to transport gaseous effluent from the SGTS and primary containment atmospheric control (PCAC) system to the main stack. This system consists of ducts, dampers, pipes, valves and the 20-inch underground vent to the main stack.

A deluge spray is provided to wet down the charcoal beds in case of a fire. The spray components supply water to spray headers in each of the filtration trains. This piping forms part of the pressure boundary of the SGTS filter housing.

Following an accident, the SGTS maintains a negative pressure inside the reactor building, which minimizes the ground-level release of fission products by exfiltration. The SGTS also removes particulates and iodines by filtration prior to release through the main stack. In addition to these safety functions, portions of this system provide an extension of the secondary containment boundary.

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

- Remove particulates and gaseous contaminants from the reactor building's contaminated exhaust ventilation system air stream to minimize the release of radioactive material from the stack. This function is performed by the SGTS filters.
- Minimize the ground level release of fission products from the reactor building (while it is isolated) by maintaining a slightly negative building pressure. This function is performed by the SGTS exhaust fans.
- Support secondary containment.

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

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

<u>UFSAR References</u>

Section 5.3

<u>Components Subject to AMR</u>

A portion of reactor building drain piping is included in this evaluation as it supports maintaining secondary containment and the ability of the SGTS to perform its function. See the radioactive waste system description in Section 2.3.3.14 for further information.

The instrument air accumulators for the SGTS dampers are evaluated with the instrument air system (Section 2.3.3.8). Remaining SBGT components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-M-210	LRA-M-283
LRA-M-215 Sheet 1	LRA-M-294
LRA-M-227 Sheet 1	

2.3.2.7 Primary Containment Penetrations

System Description

The purpose of the primary containment penetrations system is to provide the capability for rapid isolation of all pipes or ducts which penetrate the primary containment by means which provide a containment barrier as effective as is required to maintain leakage within permissible limits.

Mechanical penetrations for systems with a system-level aging management review are reviewed with that system. The scope of this review is passive mechanical penetration components not included in other system reviews. This review includes only the containment penetration portion of these systems.

The grouping of containment isolation valves 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.

Containment penetrations have the following intended function for 10 CFR 54.4(a)(1).

- Support primary containment isolation.

Containment penetrations have no intended functions for 10 CFR 54.4(a)(2) or (a)(3).

UFSAR References

Section 5.2

Components Subject to Aging Management Review

This evaluation includes mechanical penetrations that are part of the drywell instrument pressure sensing lines, traversing incore probe, radwaste collection, recirc pump and instrumentation, and the H_2O_2 analyzer. Remaining containment penetrations are reviewed with the systems with which they are associated.

The structural portions of penetrations are reviewed with the primary containment structure (Section 2.4.1). The internals of electrical penetration assemblies are reviewed with the electrical systems (Section 2.5).

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

Table 3.2.2-7 provides the results of the aging management review.

License Renewal Drawings

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

LRA-M-227 Sheet 1	LRA-M-251 Sheets 1 and 2
LRA-M-232	LRA-M-252 Sheet 1
LRA-M-241 Sheet 1	LRA-M-252 Sheet 2

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

Component Type	Intended Function(s)
Bolting	Pressure boundary
Condensing pots	Pressure boundary
Cyclone separator	Pressure boundary Filtration
Heat exchanger (bonnets)	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
Spray header	Pressure boundary
Spray nozzles	Flow control Pressure boundary
Strainer	Filtration
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
Cooling coil	Heat transfer Pressure boundary
Cyclone separator	Filtration Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
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
Tee-quenchers (submerged)	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
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
Pilot valve housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Rupture disc	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 2.3.2-5
Reactor Core Isolation Cooling
Components Subject to Aging Management Review**

Component Type	Intended Function(s)
Bolting	Pressure boundary
Condenser shell	Pressure boundary
Drain pot	Pressure boundary
Filter 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
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
Ductwork	Pressure boundary
Expansion joint	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-7
Primary Containment Penetrations System
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 included in this section.

- standby liquid control
- salt service water
- reactor building closed cooling water
- emergency diesel generator
- station blackout diesel generator system
- security diesel
- fuel oil
- compressed air (instrument air)
- fire protection—water
- fire protection—halon
- heating, ventilation and air conditioning
- primary containment atmosphere control
- fuel pool cooling and fuel handling and storage systems
- 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 inject a neutron-absorbing solution into the reactor to achieve and maintain sub-criticality in the event that not enough control rods can be inserted in the reactor core to accomplish shutdown and cooldown. The SLC system is an independent, diverse backup system to the CRD system.

The SLC system consists of an SLC tank, a test tank, two pumps, two explosive actuated valves, and associated piping and valves necessary to prepare and inject the neutron absorbing solution into the reactor and to test the SLC system. The liquid is piped into the reactor vessel and discharged near the bottom of the core shroud so that 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 injection of neutron-absorbing solution in the event that not enough of the control rods can be inserted to counteract the positive reactivity effects of a colder moderator.
- Support primary containment isolation.
- 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 has 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 3.8

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 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-M-249

2.3.3.2 Salt Service Water

System Description

The purpose of the salt service water (SSW) system is to function as the ultimate heat sink (UHS) for the reactor building closed cooling water (RBCCW) and turbine building closed cooling water (TBCCW) systems during plant operations.

The SSW system consists of five vertical service water pumps located in the intake structure, and associated piping and valves. The SSW system consists of two open loops. Each loop has two pumps (plus a common spare). In normal operation SSW pumps are operated with the cross-tie valves open. The pumps take suction from Cape Cod Bay and discharge to a common header, which supplies both loops. Each loop provides coolant to one RBCCW heat exchanger and one TBCCW heat exchanger. The water from the outlet of the heat exchangers returns to the bay, which is the ultimate heat sink. Following a LOCA, only one SSW system loop is required.

The SSW system can supply water to the screen wash pumps to support cleaning the traveling water screens. The SSW system can supply water to the Triplex filter as an alternate supply of cooling water to the circulating water pumps. These functions do not meet the 10 CFR 54.4(a)(1) or (a)3 criteria.

The SSW system also provides a permanent piping connection from the SSW pumps to the RHR system to provide an additional source of water to cool the reactor. The use of SSW as a source of water for reactor pressure vessel injection or primary containment flooding when directed by emergency operating procedures is for a severe accident beyond the plant design basis and therefore does not meet the criteria of 10 CFR 54.4(a)(1).

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

- Provide cooling to the RBCCW system, which cools essential equipment in the reactor building.

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

- The system is credited in the 10 CFR 50 Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Section 10.7

Components Subject to Aging Management Review

The RBCCW heat exchangers are evaluated with the RBCCW system (Section 2.3.3.3). 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). Remaining SSW 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-M-212 Sheet 1

2.3.3.3 Reactor Building Closed Cooling Water

System Description

The purpose of the reactor building closed cooling water (RBCCW) system is to provide required cooling to equipment located in the reactor building during all modes of operation and to provide a barrier between the primary system and the salt service water system. The RBCCW provides cooling to essential and non-essential equipment, including core standby cooling systems (CSCS) components, equipment area cooling system, residual heat removal (RHR) heat exchangers, fuel pool heat exchangers, CRD pumps and reactor recirculation pumps. Portions of the system penetrating primary containment provide an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment.

The RBCCW system consists of two independent closed loops providing redundancy during accident conditions. Each loop has three parallel pump trains, one heat exchanger, one surge tank and a chemical addition tank. The two loops are normally isolated from each other and can be interconnected through cross-tie headers.

Portions of the RBCCW are designated as ASME Class 1 pressure boundary only (PBO). These portions are seismic Class I with respect to their ability to retain their integrity (pressure boundary) and prevent loss of water during and after seismic events. ASME Class 1 PBO components supply non-essential heat loads under accident conditions.

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

- Provide an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment from primary containment.
- Maintain pressure boundary between RBCCW and adjacent systems or surrounding atmosphere.
- Provide cooling for RHR, HVAC, and core spray components (RHR pump lube oil coolers, RHR heat exchangers, RCIC and HPCI pump area cooling coils, RHR-core spray pump area cooling coils, and core spray pump motor thrust bearings).

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

- The RBCCW system is credited in the 10 CFR 50 Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Section 10.5

Components Subject to Aging Management Review

Heat exchangers cooled by RBCCW are evaluated in various aging management reviews. Recirc pump coolers are included in Section 2.3.1.3, Reactor Coolant Pressure Boundary. RHR heat exchanger and seal coolers are included in Section 2.3.2.1, Residual Heat Removal System. Core spray pump motor bearing coolers are in Section 2.3.2.2, Core Spray System. HPCI and RCIC pump area coolers are included in Section 2.3.3.11, Heating, Ventilation and Air Conditioning. Remaining RBCCW heat exchangers are included in this section.

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). Remaining RBCCW components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-M-212 Sheet 1 LRA-M-215 Sheets 1, 2, 3, and 4

2.3.3.4 Emergency Diesel Generator

System Description

The purpose of the emergency diesel generators is to provide the necessary power to safely shutdown the reactor with a loss of off-site power. Each of the diesel generators can carry the loads necessary for a safe plant shutdown. The emergency diesel generators are designed to start automatically upon receiving remote signals and come up to generator operating speed and voltage ready to assume load. This system includes the diesel generator units and supporting subsystems, including jacket cooling water, lubricating oil, starting air, and the turbo-boost assist air system. EDG components containing fuel oil are evaluated separately as a part of the fuel oil storage and transfer system.

The jacket water system removes excess heat from the engine and its supporting auxiliary equipment. Each diesel generator has a jacket water cooling system, which consists of several components that make up a closed cooling water loop. The main loop is the jacket water cooling loop, which removes excess heat from the EDG. Other sub-loops cool the compressed combustion air, the turbocharger, and the EDG lube oil. Jacket water temperature is regulated by flow control through air-cooled radiators.

The air start and turbo air assist systems support the startup and operation of the emergency diesel generators. Each EDG engine is started by high pressure air, which powers the air motors to crank the engine and start combustion. The turbo-boost assist air system supplies air to the turbocharger when needed.

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

- Provide power to essential AC busses during a loss of offsite power.

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

- Provide power to essential AC busses as credited for fire protection (10 CFR 50.48).

UFSAR References

Section 8.5

Components Subject to Aging Management Review

Components that supply fuel oil are reviewed with the fuel oil system (Section 2.3.3.7). 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). Remaining EDG system 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-M-219	LRA-M-271
LRA-M-259	LRA-M-272

2.3.3.5 Station Blackout Diesel Generator System

System Description

The purpose of the station blackout (SBO) diesel generator is to provide the necessary power to maintain the plant in a safe condition with a loss of off-site power and a loss of the emergency diesel generators. The SBO diesel generator is capable of supplying either 4160 VAC emergency bus but not both emergency busses at the same time. This system includes the diesel generator unit and supporting subsystems, including jacket cooling water, lubricating oil, and starting air. The fuel oil system is evaluated as a separate system.

The jacket water system supports operation of the SBO diesel generator by removing excess heat from the engine and its supporting auxiliary equipment. The jacket water cooling system consists of several components that make up a closed cooling water loop. The main loop is the jacket water cooling loop, which removes excess heat from the SBO diesel generator. Other sub-loops cool the compressed combustion air, the turbocharger, and the SBO diesel generator lube oil. Jacket water temperature is regulated by flow control through air-cooled radiators.

The SBO diesel generator air start system supports the startup and operation of the SBO diesel generators. The SBO engine is started by high pressure air, which powers the air motors to crank the engine and start combustion.

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

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

- Provide power to essential AC busses during a station blackout (10 CFR 50.63).

UFSAR References

Section 8.10

Components Subject to Aging Management Review

SBO diesel generator components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-M-264

2.3.3.6 Security Diesel

System Description

The purpose of the security system is to provide equipment necessary for maintaining site security. The security system includes the security diesel, 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 diesel 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 diesel generator components are reviewed as listed below.

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

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

License Renewal Drawings

None

2.3.3.7 Fuel Oil

System Description

The purpose of the diesel fuel oil system is to provide for the storage and transfer of fuel oil to various plant systems. The system includes bulk storage tanks, day tanks, transfer pumps, piping, and valves to provide fuel to the emergency diesel generators, station blackout diesel, diesel fire pump, security diesel generator, and the plant heating boilers.

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

- Support operation of the emergency diesel generators.

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

- The system is credited in the 10 CFR 50 Appendix R safe shutdown capability analysis (10 CFR 50.48). This includes supporting operation of the diesel-driven fire pump, the emergency diesel generators, and the security diesel.

- Support operation of the station blackout diesel generator (10 CFR 50.63).

UFSAR References

Sections 8.5, 8.10 and 10.8

Components Subject to Aging Management Review

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). Remaining FO system components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-M-223
LRA-M-264
LRA-M-265

2.3.3.8 Compressed Air (Instrument Air)

System Description

The purpose of the compressed air system (CAS) is to provide a continuous supply of oil-free compressed air which is used for instrumentation, control, various mixing, sluicing, scrubbing, and drying operations, and for operation of miscellaneous service equipment. The system consists of the high pressure service air system and instrument air system (IAS) and the low pressure service air system.

The high pressure service air system supplies a common header using three reciprocating and three rotary screw-type air compressors arranged in parallel. One of the rotary screw-type compressors is driven by a diesel engine. The high pressure service air system delivers air to various plant services which do not require drying, such as air powered tools. Low pressure service air is supplied by either two rotary blowers or through a crosstie from the high pressure service air system. The low pressure service air system supplies oil-free air for mixing, agitating, and purging functions. Service air has no intended functions.

The instrument air system is supplied from the common header through separate dryers and filters. The system provides dry, oil-free air to various systems for the operation of valves and instrumentation. A backup air supply is available from the diesel-driven compressor; however, this compressor performs no intended function for license renewal. The instrument air system contains separate accumulators and tanks that store high pressure air or nitrogen for operation of safety-related equipment (main steam safety valves, nuclear system pressure relief valves, torus vacuum breakers, standby gas treatment system dampers, and EDG dampers). Portions of this system provide an extension of the primary containment.

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

- Support primary containment isolation.
- Provide seismic Class I accumulators for safety-related equipment that requires instrument air to perform an intended function.

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

- Support ADS operation as credited in the 10 CFR 50 Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Section 10.11

Components Subject to Aging Management Review

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). Remaining CAS 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-M-67-96	LRA-M-227 Sheet 1
LRA-M-219	LRA-M-250 Sheet 1
LRA-M-220 Sheet 2	LRA-M-252 Sheet 1
LRA-M-220 Sheet 3	LRA-M-294

2.3.3.9 Fire Protection—Water

System Description

The purpose of the fire protection system is to provide adequate fire protection capability in all areas of the station. The fire protection system is designed to furnish water, halon, carbon dioxide, and/or dry chemicals as necessary for fire control in the station. This section describes the fire protection—water system. The fire protection—Halon system is described in the next section (Section 2.3.3.10). Other fire suppression systems are the automatic dry chemical fire suppression system, carbon dioxide fixed and portable suppression, and portable dry chemical, pressurized water and CO_2 fire extinguishers. These systems have no intended functions for license renewal. Structural fire protection components, such as fire barriers and fire doors, are reviewed in the structural evaluation of the building in which they are contained.

The fire water system consists of a site water supply supplemented by a city water main. The water supply is delivered by either an electric motor-driven pump or a diesel engine-driven pump. A small jockey pump maintains a constant pressure on the water system. The pumps feed outdoor fire hydrants, interior hose stations, sprinkler systems, and deluge systems for the station, and can be used as a back-up supply to the screenwash system.

The fire protection—water system has no intended functions for 10 CFR 54.4(a)(1).

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

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

UFSAR References

Section 10.8

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. 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). Remaining fire protection—water system components are reviewed as listed below.

Table 2.3.3-9 lists the fire protection—water component types that require aging management review.

Table 3.3.2-9 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 drawings.

LRA-M-218 Sheets 1, 2, 3, 5, 6, 7, 8 and 9

2.3.3.10 Fire Protection—Halon

System Description

The purpose of the fire protection system is to provide adequate fire protection capability in all areas of the station. The fire protection system is designed to furnish water, halon, carbon dioxide, and/or dry chemicals as necessary for fire control in the station. This section describes the fire protection—Halon system. The fire protection—water system is described in the previous section (Section 2.3.3.9).

The fire protection-Halon system provides Halon as necessary for fire protection. The fire protection-Halon system provides adequate fire protection in areas of the plant protected by Halon systems and ensures safe shutdown in the event of a fire in areas of the plant where Halon systems are required for compliance with the Commission's regulations for fire protection. There are no safety-related components in the Halon system; however, passive mechanical components in the cable spreading room Halon system are required for fire protection (10 CFR 50.48). This is the only portion of the Halon system subject to these regulations.

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

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

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

UFSAR References

Section 10.8

Components Subject to Aging Management Review

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-M-218 Sheet 4

2.3.3.11 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 subsystems which together comprise plant HVAC equipment. The HVAC systems have been individually evaluated for inclusion in the scope of license renewal. The systems are described below to correlate with the UFSAR system descriptions with reference to the PNPS HVAC systems encompassed by system number 24.

The *drywell coolers* (UFSAR Section 5.2.3.1, system 24F) are designed to maintain drywell (primary containment) atmosphere temperatures within an acceptable range during normal station operation using RBCCW as a heat sink. The drywell coolers automatically shut down in the event of a LOCA combined with the loss of offsite AC power and are not required to provide cooling following postulated design basis accidents. Drywell coolers have the safety function of maintaining the RBCCW pressure boundary.

MCC cubicle atmosphere control (UFSAR Section 8.4.5.2, system 24Q) provides cooling and ventilation to safety-related motor control centers B17, B18, and B20 at the 23' elevation of the reactor building.

The *station heating system* (UFSAR Section 10.9.3.2, system 24A) is a closed, low-temperature, forced hot water heating system supplied by two auxiliary boilers.

Reactor building HVAC (UFSAR Section 10.9.3.3 and 5.3, system 24C and 24K) is divided into three major ventilation zones. One zone encloses the spaces above the operating (refueling) floor. The second zone encloses the recirculation pump motor generator sets (system 24K), which uses RBCCW as its heat sink, and the third zone encloses the remainder of the reactor building. Each zone is served by its own air supply and exhaust system in order to maintain the independence of the zones. The system includes components for purging the drywell or torus atmosphere with fresh air, if entry is necessary. This cooling is not safety-related or required to support regulated events. However, the reactor building HVAC system supports the secondary containment function by automatically closing HVAC-related openings in secondary containment as required. Coolers using RBCCW (system 24K) have the safety function of maintaining the RBCCW pressure boundary.

Turbine building HVAC (UFSAR Section 10.9.3.4, system 24B and 24M) supplies filtered air to all areas of the turbine building. An independent switchgear room emergency ventilation system (SREVS) is provided for each of the two switchgear and battery rooms. The SREVS provides a safety-related source of ventilation to maintain a mild environment for safety-related equipment in the event the normal turbine building ventilating system is not available. Intended functions are identified below. The offgas retention building (also known as the AOG building) unit coolers and exhaust fans (PNPS system 24M) are part of the turbine building HVAC system.

Radwaste building HVAC (UFSAR Section 10.9.3.5, system 24G) maintains required space temperatures, provides adequate ventilation to remove heat rejected from operating equipment, and provides adequate supply and exhaust to maintain the direction of air flow from lesser to increasingly greater areas of potential radioactivity. The system has two full-capacity air-handling units to provide filtered outside air to all radwaste areas. Two full-capacity exhaust fans discharge the air to the discharge plenum of the reactor building main ventilation stack, after it passes through two full-capacity two-stage filter banks.

Access control area air conditioning (UFSAR Section 10.9.3.6, system 24P) maintains ventilation and constant temperature and humidity in the access control area. This area includes the chemical laboratory and counting rooms, frisking area, decon shower, changing rooms, and HP offices.

Intake structure HVAC (UFSAR Section 10.9.3.7, system 24L) provides ventilation to the six areas of the intake structure: condenser circulating water pumps (2 areas), salt service water pumps, fire pumps, chlorination system, and traveling screens.

PASS mezzanine MCC rooms ventilation (UFSAR Section 10.9.3.8) provides cooling and ventilation to electrical equipment rooms containing MCCs B17A and B18A on the PASS mezzanine. The fans supporting the ventilation systems are controlled by temperature switches located in the rooms. Each system supplies outside air into its respective room to remove heat generated by the equipment in the room. These systems will operate with a loss of off-site power.

Diesel generator building HVAC (UFSAR Section 10.9.3.9, system 24S) maintains building temperature when the diesels are idle and supports operation of the EDG and auxiliaries systems upon diesel startup. The normal supply and exhaust fans shut down automatically upon EDG actuation. Safety-related ventilation of the diesel generator area is performed by diesel-driven fans, which provide sufficient combustion air to run the EDG at full load, remove heat from the jacket water-cooling radiator and maintain an acceptable operating environment in the EDG areas.

The *main control room environmental control system* (UFSAR Section 10.17, PNPS system 24H-control complex HVAC and 24J-control room high efficiency filtration system) supplies heating, ventilation and air conditioning for the control room, the cable spreading room, and the computer room. The system includes two independent supply fans with associated heating and cooling units; mixing boxes to independently control air supply temperatures to the control room areas, the cable spreading room, and the computer room; two independent exhaust/recirculation fans (all in system 24H); and two independent, high efficiency, air filtration units for emergency treatment of outside supply air and associated fans (system 24J).

The *equipment area cooling system (EACS)* (UFSAR Section 10.18, PNPS system 24D-HPCI room HVAC and 24E-reactor building quads HVAC) maintains the local environment of the core standby cooling systems (CSCS), RCIC, and control rod drive pumps at temperatures within their normal operating limits. EACS consists of fan-coil unit coolers which control the environmental temperature in the RHR-core spray pump corner compartments, the RCIC corner compartment, the HPCI equipment room, and the control rod drive feedwater pump corner compartment. RBCCW supplies water to the cooling coils and serves as the heat sink for the EACS. The system has the safety function of maintaining the local environment of the electrical components of the CSCS (RHR, core spray, and HPCI) and RCIC at temperatures within their maximum allowable operating limits. Remaining EACS coolers using RBCCW have the safety function of maintaining the RBCCW pressure boundary.

SBO diesel building HVAC provides ventilation for the SBO diesel. The skid-mounted SBO diesel is located in a pre-engineered enclosure for protection from the environment. The radiator is outside the enclosure, but the heat gains from engine operation must be exhausted from the enclosure. The enclosure ventilation louvers open and fans start to provide ventilation to the SBO diesel.

Security diesel building HVAC provides ventilation for the security diesel. The security diesel room is cooled by two louvers that open to provide cooling when the security diesel is in operation. A fan that is part of the security diesel engine blows air out the exhaust louver.

The reactor building auxiliary bay HVAC (24N), administration building HVAC (24R), and TSC HVAC (24T) provide ventilation for their respective areas. These HVAC systems do not perform intended functions.

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

- Provide a suitable operating environment for safety-related equipment. This function is performed by the following HVAC systems.
    - MCC cubicle atmosphere control (includes PASS mezzanine MCC rooms ventilation)
    - turbine building HVAC system (function performed by the switchgear room emergency ventilation)
    - intake structure HVAC system (service water pump area)
    - emergency diesel generator HVAC system (safety-related components only)
    - control room high efficiency filtration system (system 24J)
    - EACS (function performed by HPCI room HVAC, RCIC room HVAC, and RHR northwest and southeast quadrants HVAC)

- Support secondary containment isolation. This function is performed by the reactor building ventilation.
- Maintain RBCCW pressure boundary. This function is performed by coolers which use RBCCW as a heat sink.

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

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

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

- Provide a suitable operating environment for equipment credited for fire protection (10 CFR 50.48). This function is performed by the following systems.
    - intake structure HVAC system (fire pumps area)
    - emergency diesel generator HVAC system (safety-related HVAC components only)
    - EACS (function performed by HPCI room HVAC, RCIC room HVAC, and RHR northwest and southeast quadrants HVAC)
    - security diesel building ventilation (security diesel provides emergency lighting credited in 10 CFR 50 Appendix R safe shutdown analysis)

- Provide a suitable operating environment for equipment credited for station blackout (10 CFR 50.63). This function is performed by the SBO diesel building HVAC.

In summary, the following HVAC subsystems perform intended functions and are therefore within the scope of license renewal.

- MCC enclosures for B17, B17A, B18, B18A and B20 ventilation equipment
- reactor building normal ventilation secondary containment isolation components
- switchgear room emergency ventilation
- intake structure SSW pumps and fire pumps ventilation equipment
- emergency diesel generator ventilation subsystems
- control room high efficiency filtration system
- HPCI, RCIC and RHR area coolers (EACS)
- SBO diesel building ventilation
- security diesel generator room cooling
- CRD pump area cooling (RBCCW pressure boundary only)
- recirc MG set cooling and ventilation (RBCCW pressure boundary only)
- drywell atmosphere cooling (RBCCW pressure boundary only)
- water-filled portions with the potential for spatial interaction with safety-related components
- ductwork that interfaces with safety related components (structural support function)

UFSAR References

Sections 5.2, 5.3, 8.4.5.2, 10.9.3, 10.17 and 10.18

Components Subject to Aging Management Review

Components required only for RBCCW pressure boundary function are reviewed with RBCCW (Section 2.3.3.3). 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). Remaining HVAC 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-M-283	LRA-M-289
LRA-M-286	LRA-M-292
LRA-M-288	

2.3.3.12 Primary Containment Atmosphere Control

System Description

This description includes the primary containment atmosphere control (PCAC) system and the post-accident sampling system (PASS).

The purpose of the primary containment atmospheric control (PCAC) system is to establish and maintain an inert atmosphere in primary containment. The system is available to provide combustible gas control under accident conditions if necessary.

The PCAC system consists of fans, valves, nitrogen vaporizers, storage tanks, piping, ducts, and an oxygen analyzer. Normal and emergency exhaust lines off both the drywell and torus permit release of contaminated gases to the SGTS. Connections to an H_2/O_2 analyzer allow for drywell and torus atmosphere sampling post-accident. The PCAC system oxygen analyzer functions during normal operations and has no safety function. Portions of the system contain water and have the potential for spray or leakage affecting safety-related equipment. The system has a structural support function for nonsafety-related equipment with the potential to affect safety-related equipment.

PCAC uses nitrogen to purge and inert the drywell and suppression chamber. Nitrogen is supplied from a cryogenic storage tank for normal system operation. A liquid nitrogen supply trailer is available to augment the storage tank during initial containment inerting. Backup nitrogen cylinders are provided for drywell instrumentation. The nitrogen supply subsystem has no intended functions.

The purpose of the post-accident sampling system (PASS) is to obtain samples of the reactor coolant and containment atmosphere under post accident conditions. The system has no safety functions except support of primary containment isolation and the reactor coolant pressure boundary.

PASS consists of components provided to obtain liquid samples (from reactor coolant or the suppression pool) or gas samples (from drywell or torus atmosphere). After samples are obtained, radiological and chemical analyses can be performed on site, or the samples can be transported off-site for analysis. The H_2/O_2 analyzer (panels C-172 and C-173) is used to diagnose beyond design basis accidents (BDBA) to determine the hydrogen and oxygen concentration in primary containment and is not safety-related.

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

- Assist in combustible gas control in primary containment under accident conditions.
- Support primary containment isolation.

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

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

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

PASS 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.

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

UFSAR References

Sections 5.2.3, 5.4, 10.11.3.1 (backup nitrogen cylinders) and 10.19 (PASS).

Components Subject to AMR

PASS containment isolation components are reviewed with containment penetrations (Section 2.3.2.7). PASS components in the reactor coolant pressure boundary are reviewed with the reactor coolant system pressure boundary (Section 2.3.1.3). Nonsafety-related portions of PCAC and PASS 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). Remaining PCAC and PASS components are reviewed as listed below.

Table 2.3.3-12 lists the component types that require aging management review.

Table 3.3.2-12 provides the results of the aging management review.

License Renewal Drawings

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

LRA-M-227 Sheet 1	LRA-M-239 Sheet1
LRA-M-227 Sheet 2	LRA-M-294

2.3.3.13 Fuel Pool Cooling and Fuel Handling and Storage Systems

System Description

The purpose of the fuel pool cooling (FPC) and cleanup system is to maintain fuel pool water clarity, to minimize the concentration of spent fuel fission and corrosion products in the fuel pool water, and to provide fuel pool water temperature control such that operating personnel can efficiently perform necessary manual operations above the pool.

The fuel pool cooling system consists of two pumps, two heat exchangers, a filter and a demineralizer to filter and cool the spent fuel storage pool during normal plant operation as well as the reactor basin and the dryer/separator pool during refueling outages. Lines penetrating the refueling cavity and dryer/separator floor are seismic Class I and isolated by safety-related valves to protect spent fuel pool inventory, and these lines and valves are components in the fuel pool cooling system. Except for these lines and valves, equipment in the system is seismic Class II. Lines that extend below a minimum level in the pool are equipped with siphon breakers to prevent draining the pool to unsafe levels. A safety-related source of makeup to the pool is provided by the RHR system and the suppression pool.

Although cooling by the spent fuel pool heat exchanger is not a safety function, the reactor building closed cooling water system (RBCCW) pressure boundary of the heat exchanger is required to maintain the integrity of the safety-related RBCCW system.

The spent fuel pool (SFP) stores spent fuel from the reactor. Racks provided in the pool for support of the fuel assemblies contain a neutron absorber. Both Boraflex and Boral neutron absorbers are in use in the SFP racks. Some racks consist of welded stainless steel assemblies in the shape of cruciforms, angles, and tees. Sheets of Boraflex neutron absorber material are sandwiched between the stainless steel sheets. The remaining racks consist of welded stainless steel boxes. Sheets of Boral neutron absorber material are sandwiched between the box walls and a stainless steel sheath welded to the box walls to hold the Boral material in position.

The reactor basin and dryer/separator pool allow flooding during refueling outages to shield against radiation from the reactor vessel internals and allow the transfer of fuel assemblies under water. Skimmer drain lines allow flow from the reactor basin and the dryer/separator pool into a skimmer surge tank that acts as a surge volume and filters the water entering the suction of the spent fuel pool pumps.

The refueling platform spans the reactor and spent fuel pools and runs on platform guide tracks embedded in the floor. Five refueling slot plugs and two fuel storage pool gates separate the spent fuel pool from the reactor basin cavity.

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

- Maintain isolation of the refueling cavity and dryer/separator floor as required. This function is performed by the seismic Class I components in lines penetrating the refueling cavity and dryer/separator floor.
- Maintain safe level of pool in the event of a line break. This function is performed by the siphon breakers.
- Provide criticality protection. This function is performed by Boral and Boraflex sheets in the pool racks.
- Maintain the RBCCW pressure boundary.

The systems have the following intended function for 10 CFR 54.4(a)(2).

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

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

UFSAR References

Sections 10.2, 10.3, 10.4

Components Subject to AMR

The spent fuel pool, reactor basin, dryer/separator storage pool, new fuel storage vault and racks, and the refueling platform are included in the structural evaluations for the reactor building (Section 2.4.2) (including fuel racks, gates, and liner, reactor well refueling bulkhead and bellows seal).

The components required to satisfy the RBCCW pressure boundary function are reviewed with RBCCW (Section 2.3.3.3). Nonsafety-related components whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.14. Remaining FPC 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

LRA-M-231

LRA-M-241 Sheet 1

2.3.3.14 Miscellaneous Systems in Scope for (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.

Functional failures of nonsafety-related SSCs which could impact a safety function were identified only for those systems with components supporting the main condenser and MSIV leakage pathway. Systems with this intended function are described in Section 2.3.4, Steam and Power Conversion Systems, and are not included in this section.

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

At PNPS, 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. Portions of systems identified as not requiring review for spatial effects were evaluated to determine if nonsafety-related components required review for their structural support function. Such safety-related to nonsafety-related interfaces were 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

For PNPS, 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 the following criteria are met:

- the components are located in a space containing safety-related SSCs, and
- the potential exists for spatial interaction from leakage or spray.

These systems are listed in Table 2.3.3.14-A.

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

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 Name	Section Described
Circulating Water	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Compressed Air	Section 2.3.3.8, Compressed Air (Instrument Air)
Condensate	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Condensate Demineralizers	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Condensate Storage and Transfer	Section 2.3.4.1, Condensate Storage System
Control Rod Drive	Section 2.3.1, Reactor Coolant System
Core Spray	Section 2.3.2.2, Core Spray System
Emergency Diesel Generator	Section 2.3.3.4, Emergency Diesel Generator

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)) (Continued)

System Name	Section Described
Extraction Steam	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Feedwater	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Feedwater Heater Drains and Vents	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Fire Protection—Water	Section 2.3.3.9, Fire Protection—Water
Fuel Oil Storage and Transfer	Section 2.3.3.7, Fuel Oil
Fuel Pool Cooling and Demineralizer	Section 2.3.3.13, Fuel Pool Cooling and Fuel Handling and Storage Systems
Heating, Ventilation and Air Conditioning	Section 2.3.3.11, Heating, Ventilation and Air Conditioning
High Pressure Coolant Injection	Section 2.3.2.4, High Pressure Coolant Injection
Main Condenser	Section 2.3.4.4, Main Condenser
Main Steam	Section 2.3.4.2, Main Steam
Offgas and Augmented Offgas	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Post-Accident Sampling	Section 2.3.3.12, Primary Containment Atmosphere Control
Potable and Sanitary Water	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Primary Containment Atmospheric Control	Section 2.3.3.12, Primary Containment Atmosphere Control
Radioactive Waste	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Reactor Building Closed Cooling Water	Section 2.3.3.3, Reactor Building Closed Cooling Water
Reactor Core Isolation Cooling	Section 2.3.2.5, Reactor Core Isolation Cooling
Reactor Coolant System	Section 2.3.1, Reactor Coolant System
Reactor Water Cleanup	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Residual Heat Removal	Section 2.3.2.1, Residual Heat Removal System
Salt Service Water	Section 2.3.3.2, Salt Service Water
Sampling	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Sanitary Soiled Waste and Vent, Plumbing and Drains	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Screen Wash	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)

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))
(Continued)

System Name	Section Described
Standby Liquid Control	Section 2.3.3.1, Standby Liquid Control
Turbine Building Closed Cooling Water	Section 2.3.3.14, Miscellaneous Systems in Scope for (a)(2)
Turbine Generator and Aux.	Section 2.3.4.3, Turbine-Generator and Auxiliaries

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. This includes the structural/seismic support function for components outside the safety class pressure boundary.

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), unless located in an excluded room. Table 2.3.3.14-B lists the few areas excluded from review under this conservative approach.

Section 3.3.2.1.14, 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., feedwater).

Circulating Water

The purpose of the circulating water system (CWS) (also called the sea water 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 incidental sources. Seawater from Cape Cod Bay passes through trash racks and then through traveling screens. A major portion of the flow is directed to the circulating water pumps, which deliver water to the main condenser. The discharge from the condenser and from the service water system is returned via the discharge channel to Cape Cod Bay.

The circulating water system consists of two circulating water pumps and associated piping and valves.

Condensate

Together with the feedwater system, the purpose of the condensate system is to provide a dependable supply of high quality, pre-heated feedwater from the condenser hotwell to the reactor at the required flow rates under normal and transient conditions. The condensate pumps take the condensate from the condenser hotwells and pump it through the air ejector condensers, gland seal condenser, and condensate demineralizers. Demineralizer effluent flows in two parallel streams through low-pressure feedwater heaters (three per train) to the reactor feed pumps, which are the boundary between condensate and feedwater systems.

Condensate Demineralizers

The purpose of the condensate demineralizer system (CDS) is to maintain the required purity of feedwater to the reactor. To assure the specified conditions and produce best feedwater quality attainable, a full-flow mixed-bed CDS is provided. The CDS consists primarily of mixed-bed ion exchangers and supporting piping and valves, including components used to transfer spent and new or regenerated resin.

Originally, acid and caustic subsystems supported regeneration of the demineralizer resin. External resin cleaning equipment is now used and the primary components of the acid and caustic subsystems are abandoned in place.

Extraction Steam

The purpose of extraction steam is to provide steam to the feedwater heaters to increase main feedwater temperature prior to entry into the reactor. The system includes moisture separators between the high-pressure and low-pressure turbines.

Besides the moisture separators, this system consists primarily of piping and valves between the various stages of the high- and low-pressure turbines and the feedwater heaters. The pre-heating process is accomplished by extracting steam from various high- and low-pressure turbine stages and heating the feedwater system through the cascading series of feedwater heaters.

Feedwater

The purpose of the feedwater system, together with the condensate system, is to provide a dependable supply of high quality, pre-heated feedwater from the condenser hotwell to the reactor at the required flow rates under normal and transient conditions. Flow from the reactor feed pumps, which are the boundary between condensate and feedwater systems, passes through high pressure feedwater heaters, control valves, and containment isolation valves before reaching the reactor. A portion of ASME Class 1 feedwater piping provides a flow path for high pressure coolant injection and reactor core isolation cooling.

The safety-related portion of the system extends from the reactor vessel to the second containment isolation valve. The remainder of the system is not safety-related.

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

- Provide flow path for high pressure coolant injection and reactor core isolation cooling.
- Maintain integrity of reactor coolant pressure boundary.
- Support primary containment isolation.

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

- Provide flow path for HPCI and RCIC as credited for fire protection (10 CFR 50.48).

The safety-related portions of the feedwater system are reviewed as part of the reactor coolant system in Section 2.3.1.

Feedwater Heater Drains and Vents

The purpose of the feedwater heater drains and vents system is to provide pre-heating of the feedwater to the reactor pressure vessel during plant operating conditions. Feedwater is pre-heated through two parallel trains of feedwater heaters, each consisting of five heaters and one drain cooler. The feedwater heater drains provide a flow path for the moisture separator drain tanks, the steam seal regulator unloading line, and the feedwater heater cascading drains. The shell sides of the feedwater heaters are provided with vents to purge the shell of air and noncondensable gases.

Offgas and Augmented Offgas

The purpose of the offgas and augmented offgas (AOG) systems is to remove, process and dispose of non-condensable gases from the condenser. Gases from the unit are routed to the main stack for dilution and elevated release to the atmosphere.

The offgas system consists of a steam jet air ejector unit, a mechanical vacuum pump, the gland seal exhaust subsystem, offgas filters, and associated piping and valves. The steam jet air ejector unit removes air and non-condensable gases from the main condenser during power operations. A mechanical vacuum pump provides air removal during startup and shutdown. Exhaust gases are routed to the AOG and returned to the offgas filters for discharge through the main stack. The offgas system exhausts noncondensable gases from the turbine generator gland seal condenser through the gland seal holdup line to the stack. The holdup line is designed to provide approximately two minutes of holdup delay time for the radioactive gases before discharge to the main stack. The discharge of the mechanical vacuum pump is routed through the gland seal holdup line.

The AOG system consists of steam jet air compressors, catalytic recombiners, condensers, moisture separators, filters, charcoal adsorber vessels, and associated piping and valves. The system delays the release of radioactive iodine, krypton, xenon, N-13, N-16, and 0-19 isotopes sufficiently to allow optimum decay before discharge to the atmosphere. Steam dilution and controlled recombination of gaseous radiolytic hydrogen and oxygen minimize the explosion potential within the AOG system. The recombination process also reduces the quantity of gas discharged to the atmosphere.

Dilution air input to the main stack is supplied by two full-capacity nonsafety-related fans located in the filter building at the base of the main stack. The stack is designed such that prompt mixing of gas inlet streams occurs in the base to allow location of sample points as near the base as possible.

Potable and Sanitary Water

The purpose of the potable and sanitary water system is to provide drinking water and sewage system water necessary for normal station operation. Potable water is taken from the town of Plymouth water main and distributed throughout the station piping system at town water pressure.

Hot water heating units are provided for domestic use. The potable water system also supplies the circulating water pump triplex filters and provides fresh-water make up for the demineralized water system and the fire water storage tanks. Potable water is supplied to allow wash down of the standby gas treatment components; however, the associated components are part of the SGTS and are not evaluated with potable and sanitary water.

Radioactive Waste

The purpose of the radioactive waste systems is to collect, treat, and dispose of radioactive and potentially radioactive wastes in a controlled and safe manner such that the operation and availability of the station is not limited. The various subsystems of the radioactive waste systems manage liquid and solid radwaste. Gaseous radwaste is addressed in the offgas and augmented offgas systems evaluation.

The liquid radwaste system collects, processes, stores, and disposes of clean, chemical, and miscellaneous radioactive liquid wastes. Portions of the liquid radwaste system provide an extension of the primary containment. The solid radwaste systems process both wet and dry solid wastes. Wet solid wastes include backwash sludge wastes from the reactor water cleanup system and spent resins and charcoal from radwaste, spent fuel pool, and condensate demineralizers.

A portion of piping in the reactor building drains system is included in this system. Two 14-inch drain lines from each reactor building auxiliary bay have the function of providing dewatering of a major pipe rupture in each area. The discharge of these drain lines is submerged in a water trough which ensures that a sufficient water seal exists between the torus compartment and the reactor building auxiliary bay to support maintaining secondary containment and the ability of the SGTS to perform its function.

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

- Support maintaining secondary containment.
- Support primary containment isolation.

In scope reactor building drain piping is evaluated in Section 2.3.2.6, Standby Gas Treatment. The safety-related portions of the system which provide containment isolation are evaluated in Section 2.3.2.7, Primary Containment Penetrations.

Reactor Water Cleanup

The purpose of the reactor water cleanup (RWCU) system is to maintain reactor water purity within specified limits by removing soluble and insoluble impurities during all modes of reactor operation. The RWCU system reduces the secondary source of beta and gamma radiation resulting from the presence of corrosion and fission products in the reactor primary system.

The system consists of two cleanup recirculation pumps, regenerative and nonregenerative heat exchangers, two filter demineralizer units, and associated valves and piping. The RWCU system purifies the reactor coolant water by continuously removing a portion of the reactor recirculation flow from the suction side of a recirculation pump, cooling it, sending the cooled flow through filter demineralizer units to undergo mechanical filtration and ion exchange, and returning the processed fluid back to the reactor via the feedwater line. The cooling function of RWCU is not safety-related. The regenerative heat exchanger uses return water from the filter demineralizer units as the shell side cooling medium. The nonregenerative heat exchanger and pump components use RBCCW as a heat sink and the RWCU system therefore has a safety function to maintain the RBCCW pressure boundary. Portions of this system provide an extension of the primary containment. Portions of this system form part of the reactor coolant pressure boundary.

In addition to the intended function for 10 CFR 54.4(a)(2) listed above, the 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.
- Maintain RBCCW pressure boundary.

The portions of the system that form the reactor coolant pressure boundary and provide an extension of the primary containment are evaluated in Section 2.3.2.7, Primary Containment Penetrations. Components required to maintain RBCCW pressure boundary are evaluated in Section 2.3.3.3, Reactor Building Closed Cooling Water.

Sampling

Sampling systems consists of the process sampling systems, the reactor pressure boundary leak detection system, and the crack arrest verification (CAV) system.

The purpose of process sampling systems is to monitor the operational performance of station equipment. The sampling systems are designed to (1) obtain representative samples in forms which can be used in radiochemical laboratory analysis for determination of station equipment effectiveness, and (2) minimize the radiation effects at the sampling stations. Continuous analysis and grab sample capability is provided as required for plant chemistry control and trend monitoring. The process fluids sampled include reactor water, reactor cleanup water, main steam, condensate, torus water, feedwater, closed loop cooling water, circulating water, liquid waste, makeup water, standby liquid control and various other points. Also included in this system is the nonsafety-related gas sampling of the drywell and torus. Containment isolation valves for reactor coolant sampling are components in the reactor recirculation system (Section 2.3.1).

The purpose of the reactor pressure boundary leak detection system is to monitor airborne radioactivity levels in the containment atmosphere to permit operators to evaluate leakage relative to the probable source. This system includes two permanently installed panels capable of monitoring primary containment for particulate, halogen, and gaseous radioactivity in the atmosphere as a result of leaks. The system is supplied by H_2/O_2 analyzer system sampling lines downstream of the H_2/O_2 analyzer system containment isolation valves. The system does not support primary containment isolation.

The CAV system monitors water chemistry. It receives a continuous flow of high temperature reactor water from the sample line connected to the recirculation system.

Sanitary Soiled Waste and Vent, Plumbing and Drains

The purpose of the sanitary soiled waste and vent system is to collect and process sanitary waste generated at the station. The system consists of three sewage lift stations, one sewage ejection pump located in the turbine building, one package waste water treatment plant, and one sludge dewatering facility as well as the associated piping and valves.

The purpose of the plumbing and drainage system is to provide non-process plumbing and drainage. The system includes roof plumbing and drains and sanitary plumbing and drains. Station floor drains and sumps are included in the radwaste system.

Screen Wash

The purpose of the screen wash system is to remove debris from the sea water supplied to the suction of the circulating water pumps and salt service water pumps.

The screen wash system consists of two subsystems, the traveling screens and the screen wash trains. The traveling screens and the trash racks are structural components and are included in the intake structure evaluation (Section 2.4.3). The screen wash sub-system consists of two screen wash pumps connected to a common discharge header from which four spray header lines branch off to the individual traveling screens. Suction for these screen wash pumps is provided by the salt service water pumps. The traveling screens are cleaned by operating the screen wash sub-system.

Turbine Building Closed Cooling Water

The purpose of the turbine building closed cooling water (TBCCW) system is to provide cooling to equipment located in the turbine building and to station air conditioning systems.

The TBCCW system consists of a single closed loop with two pumps taking suction from two heat exchangers, which transfer heat to the salt service water (SSW) system. The TBCCW system provides an intermediate loop barrier which provides cooling while isolating components from seawater in the salt service water system.

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

- Maintain SSW system pressure boundary.

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

- Maintain pressure boundary of SSW, which is credited in the 10 CFR 50 Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

Components required to maintain the SSW pressure boundary are evaluated in Section 2.3.3.2, Salt Service Water.

UFSAR References

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

System	UFSAR Section
Circulating Water	Section 11.6
Condensate	Section 11.7 and 11.8
Condensate Demineralizers	Section 11.7
Extraction Steam	None
Feedwater	Sections 4.11, 5.2 and 11.8
Feedwater Heater Drains and Vents	Section 11
Offgas and Augmented Offgas	Sections 9.4, 11.4
Potable and Sanitary Water	Section 10.12
Radioactive Waste	Section 9.2, 9.3, 10.7.6
Reactor Water Cleanup	Section 4.9
Sampling	Sections 4.10.3.3, 10.14 and 10.20
Sanitary Soiled Waste and Vent, Plumbing and Drains	None
Screen Wash	Section 11.6
Turbine Building Closed Cooling Water	Section 10.6

Components Subject to AMR

Unless specifically excluded, all nonsafety-related components in a system determined to be in scope for 54.4(a)(2) for spatial interaction are subject to AMR. Components are excluded from review if their location is such that safety-related equipment cannot be impacted by component failure. Specific areas and components excluded for spatial interaction are listed in Table 2.3.3.14-B.

Table 2.3.3.14-B
Areas or Components Not Subject to AMR for 10 CFR 54.4(a)(2)

System	Area or Components Excluded
Hydrogen Gas Storage	Equipment in hydrogen gas storage system that contains liquid (and not gas) are located where they cannot affect safety-related equipment.
Security System	None of the passive mechanical system components that contain liquid could affect safety-related equipment, thus they do not require an aging management review per 10 CFR 54.4(a)(2).
Standby Blackout Diesel Generator	None of the passive mechanical components in this system that contain liquid could affect safety-related equipment.
Room or Area	**Excluded Area or Components**
Turbine Building	Components inside the main condensers such as the extraction steam piping and the feedwater heaters (portions inside the condensers)
Intake Structure	Hypochlorite pump room Chlorination area
Yard	Buried piping

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-C
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
Circulating Water	Table 2.3.3-14-1	Table 3.3.2-14-1
Compressed Air	Table 2.3.3-14-2	Table 3.3.2-14-2
Condensate	Table 2.3.3-14-3	Table 3.3.2-14-3
Condensate Demineralizers	Table 2.3.3-14-4	Table 3.3.2-14-4
Condensate Storage and Transfer	Table 2.3.3-14-5	Table 3.3.2-14-5
Control Rod Drive	Table 2.3.3-14-6	Table 3.3.2-14-6
Core Spray	Table 2.3.3-14-7	Table 3.3.2-14-7
Emergency Diesel Generator	Table 2.3.3-14-8	Table 3.3.2-14-8
Extraction Steam	Table 2.3.3-14-9	Table 3.3.2-14-9
Feedwater	Table 2.3.3-14-10	Table 3.3.2-14-10
Feedwater Heater Drains and Vents	Table 2.3.3-14-11	Table 3.3.2-14-11
Fire Protection—Water	Table 2.3.3-14-12	Table 3.3.2-14-12
Fuel Oil Storage and Transfer	Table 2.3.3-14-13	Table 3.3.2-14-13
Fuel Pool Cooling and Demineralizer	Table 2.3.3-14-14	Table 3.3.2-14-14
Heating, Ventilation and Air Conditioning	Table 2.3.3-14-15	Table 3.3.2-14-15
High Pressure Coolant Injection	Table 2.3.3-14-16	Table 3.3.2-14-16
Main Condenser	Table 2.3.3-14-17	Table 3.3.2-14-17
Main Steam	Table 2.3.3-14-18	Table 3.3.2-14-18
Offgas and Augmented Offgas	Table 2.3.3-14-19	Table 3.3.2-14-19
Post-Accident Sampling	Table 2.3.3-14-20	Table 3.3.2-14-20
Potable and Sanitary Water	Table 2.3.3-14-21	Table 3.3.2-14-21
Primary Containment Atmospheric Control	Table 2.3.3-14-22	Table 3.3.2-14-22

Table 2.3.3.14-C
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
Radioactive Waste	Table 2.3.3-14-23	Table 3.3.2-14-23
Reactor Building Closed Cooling Water	Table 2.3.3-14-24	Table 3.3.2-14-24
Reactor Core Isolation Cooling	Table 2.3.3-14-25	Table 3.3.2-14-25
Reactor Coolant System	Table 2.3.3-14-26	Table 3.3.2-14-26
Reactor Water Cleanup	Table 2.3.3-14-27	Table 3.3.2-14-27
Residual Heat Removal	Table 2.3.3-14-28	Table 3.3.2-14-28
Salt Service Water	Table 2.3.3-14-29	Table 3.3.2-14-29
Sampling	Table 2.3.3-14-30	Table 3.3.2-14-30
Sanitary Soiled Waste and Vent, Plumbing and Drains	Table 2.3.3-14-31	Table 3.3.2-14-31
Screen Wash	Table 2.3.3-14-32	Table 3.3.2-14-32
Standby Liquid Control	Table 2.3.3-14-33	Table 3.3.2-14-33
Turbine Building Closed Cooling Water	Table 2.3.3-14-34	Table 3.3.2-14-34
Turbine Generator and Auxiliaries	Table 2.3.3-14-35	Table 3.3.2-14-35

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. At PNPS, 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). All components in these mechanical systems, with the exception of those identified in Table 2.3.3.14-B, are subject to aging management review. 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
Heater housing	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
Salt Service Water System
Components Subject to Aging Management Review**

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

Table 2.3.3-3
Reactor Building Closed Cooling Water System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Heat exchanger (bonnets)	Pressure boundary
Heat exchanger (housing)	Structural support for Criterion (a)(1) equipment
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sample chamber	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-4
Emergency Diesel Generator System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Air motor housing	Pressure boundary
Bolting	Pressure boundary
Expansion joint (exhaust flex joint)	Pressure boundary
Filter housing	Pressure boundary
Fogger housing	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Heater housing	Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Rack booster housing	Pressure boundary
Sight glass	Pressure boundary
Silencer	Pressure boundary
Strainer housing	Pressure boundary
Strainer	Filtration
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Turbocharger housing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-5
Station Blackout Diesel Generator System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Heater housing	Pressure boundary
Lubricator housing	Pressure boundary
Motor housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Radiator box header	Pressure boundary
Radiator tubes	Heat transfer Pressure boundary
Sight glass	Pressure boundary
Silencer	Pressure boundary
Strainer housing	Pressure boundary
Strainer	Filtration
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Turbocharger	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-6
Security Diesel Generator System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (radiator)	Heat transfer Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Silencer	Pressure boundary
Tubing	Pressure boundary
Turbocharger	Pressure boundary

Table 2.3.3-7
Fuel Oil System
Components Subject to Aging Management Review

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

Table 2.3.3-8
Instrument Air System
Components Subject to Aging Management Review

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

**Table 2.3.3-9
Fire Protection—Water System
Components Subject to Aging Management Review**

Component Type	Intended Function(s)
Bolting	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Hydrant	Pressure boundary
Nozzle	Flow control Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Silencer	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Turbocharger	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-10
Fire Protection—Halon System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Flex hose	Pressure boundary
Nozzle	Flow control Pressure boundary
Piping	Pressure boundary
Tank	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-11
Heating, Ventilation and Air Conditioning Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Damper housing	Pressure boundary
Duct	Pressure boundary
Duct flexible connection	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger housing	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Louver housing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-12
Primary Containment Atmosphere Control System
Components Subject to Aging Management Review

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

Table 2.3.3-13
Fuel Pool Cooling and Fuel Handling and Storage Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Neutron absorber (boraflex)	Neutron absorption
Neutron absorber (boral)	Neutron absorption
Orifice	Pressure boundary
Piping (including sparger)	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-14-1
Circulating Water 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
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
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
Compressed 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
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
Condensate 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
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 2.3.3-14-4
Condensate Demineralizer 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
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 2.3.3-14-5
Condensate Storage and Transfer 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
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
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
Orifice	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 2.3.3-14-7
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
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
Emergency Diesel Generator System
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
Filter 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 2.3.3-14-9
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
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 2.3.3-14-10
Feedwater 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
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 2.3.3-14-11
Feedwater Heater Drains and Vents 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
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 2.3.3-14-12
Fire Protection System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Nozzle	Pressure boundary
Orifice	Pressure boundary
Piping	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 2.3.3-14-13
Fuel Oil Storage and Transfer 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
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 2.3.3-14-14
Fuel Pool Cooling and Demineralizer 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
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 2.3.3-14-15
Heating Ventilation and Air Conditioning 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
Expansion joint	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (shell)	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 2.3.3-14-16
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
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 2.3.3-14-17
Main Condenser 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
Steam trap	Pressure boundary
Tank	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
Main Steam 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
Steam trap	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 2.3.3-14-19
Offgas and Augmented Offgas System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Ejector	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 2.3.3-14-20
Post-Accident Sampling 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
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
Potable and Sanitary 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
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
Primary Containment Atmospheric 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
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
Radioactive Waste 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
Flex joint	Pressure boundary
Orifice	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 2.3.3-14-24
Reactor Building Closed Cooling 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
Tank	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
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
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 2.3.3-14-26
Reactor Coolant 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 2.3.3-14-27
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
Filter housing	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 2.3.3-14-28
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
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 2.3.3-14-29
Salt Service 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
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 2.3.3-14-30
Sampling Systems
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 (coil)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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
Sanitary Soiled Waste and Vent; Plumbing and Drains 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
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 2.3.3-14-32
Screen Wash 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
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
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
Tank	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
Turbine Building Closed Cooling Water System
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
Filter housing	Pressure boundary
Flex joint	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 2.3.3-14-35
Turbine Generator and Auxiliaries 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
Heat exchanger (shell)	Pressure boundary
Heater housing	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.

2.3.4 Steam and Power Conversion Systems

The following systems are included in this section.

- condensate storage system
- main steam
- turbine-generator and auxiliaries
- main condenser

With the exception of the condensate storage system, these systems are within the scope of license renewal primarily due to their support of the MSIV leakage pathway. Components in the MSIV leakage pathway are credited with dose reduction under accident conditions for offsite dose and control room habitability considerations. The boundary for the MSIV leakage pathway starts at the main steam piping at the reactor building wall and includes the piping and components up to and including the main condenser that form a pathway for steam and condensate to the main condenser. The boundary includes the turbine stop valves, turbine bypass valves, and drain lines for the main steam lines.

The three systems (main steam, turbine-generator and auxiliaries, and main condenser) containing components within this boundary are described below in their entirety. Components and functions described are not all associated with the MSIV leakage pathway. Main condenser and MSIV leakage pathway components are grouped into one aging management review in Section 3.4.

2.3.4.1 Condensate Storage System

System Description

The purpose of the condensate storage and transfer system (including the demineralized water subsystem) is to provide for station makeup needs and to accept condensate system reject surges. Condensate storage tanks supply plant water needs for normal power generation. The tanks are the preferred supply to the RCIC and HPCI pumps but are not relied upon in safety analyses. Makeup water to the spent fuel pool can be supplied from the condensate storage tanks; however, the safety-related source is water from the suppression pool supplied by RHR.

The demineralized water system provides demineralized water to various systems and components, including the condensate storage tanks, RBCCW and TBCCW (head tank makeup), and standby liquid control.

The condensate storage and transfer system consists of two condensate transfer pumps, two condensate storage tanks, a jockey pump, and associated piping and valves. The demineralized water system consists of a demineralized water storage tank, two pump trains, and associated piping and valves.

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

- Provide a pressure boundary for the flowpath to the RCIC and HPCI pumps. This function is performed by safety-related piping and valves that interface with RCIC and HPCI.

The condensate storage and transfer system has the following intended function for 10 CFR 54.4(a)(2).

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

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

- Provide a source of water to the HPCI and RCIC systems, which are credited in the 10 CFR 50 Appendix R analysis for safe shutdown for fire protection (10 CFR 50.48).

UFSAR References

Sections 10.3 (makeup to spent fuel pool), 10.10 and 11.9

Components Subject to Aging Management Review

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). Remaining components in the condensate storage system are reviewed as listed below.

Table 2.3.4-1 lists the component types that require aging management review.

Table 3.4.2-1 provides the results of the aging management review.

License Renewal Drawings

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

LRA-M-209
LRA-M-243
LRA-M-245

2.3.4.2 Main Steam

System Description

The purpose of the main steam (MS) system is to conduct steam from the reactor vessel through the primary containment to the steam turbine. In addition to the main steam lines, the MS system includes the main steam line flow restrictors, the main steam line isolation valves, and the safety relief valves (SRVs) and safety valves of the nuclear system pressure relief subsystem. The SRVs are also part of the automatic depressurization subsystem (ADS). The main steam system includes components from the reactor vessel up to but not including the turbine stop valves. Main steam piping inside the reactor building is designed to seismic Class I criteria.

Portions of the MS system form part of the reactor coolant pressure boundary. Portions of this system provide an extension of the primary containment. The SRVs and safety valves of the nuclear system pressure relief system prevent over-pressurization of the nuclear system. In case of a main steam line rupture outside primary containment, the main steam line flow restrictors limit the loss of water from the reactor vessel before main steam line isolation valve closure. The main steam line isolation valves close automatically upon receipt of certain isolation signals to prevent damage to the fuel cladding by limiting the loss of reactor cooling water in case of a major leak from the steam piping outside the primary containment. Main steam piping downstream of the MSIVs (beginning at the reactor building wall penetrations) to the turbine stop valves, piping and components in the turbine bypass lines, and piping and components in the drain lines from the main steam lines to the condenser provide noble gas holdup and fission product plate-out in the event of MSIV leakage.

MS system components are part of the automatic depressurization system. The intended functions for these components are listed in Section 2.3.2.3, Automatic Depressurization.

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

- Prevent over-pressurization of the nuclear system to prevent failure of the nuclear system process barrier due to pressure. This function is performed by the safety valves and SRVs.

- Limit the loss of water from the reactor vessel before main steam line isolation valve closure during a main steam line rupture outside the primary containment. This function is performed by the main steam line flow restrictors.
- Support primary containment isolation.
- Maintain integrity of reactor coolant pressure boundary.

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

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.
- Provide holdup and plate-out of fission products. This function is evaluated for components in the MSIV leakage pathway from the reactor building penetration up to (but not including) the main steam stop valves. (Main steam stop valves are components in the turbine-generator and auxiliaries system.)

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

- Seismic Class I piping up to and including the MSIVs (as supporting the ADS function) is credited in the 10 CFR 50 Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References

Sections 4.4, 4.5, 4.6, and 4.11

Components Subject to Aging Management Review

The ASME Class 1 portions of the MS system, including the safety valves, SRVs, flow restrictors and main steam isolation valves, are reviewed with the reactor coolant system (Section 2.3.1.3, Reactor Coolant Pressure Boundary). Components downstream of the SRVs, including the vacuum breakers on the discharge lines, are reviewed with the automatic depressurization system (Section 2.3.2.3, Automatic Depressurization). 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).

The following MS system components are in the main condenser and MSIV leakage pathway:

- main steam piping downstream of the MSIVs (beginning at the reactor building wall penetrations) up to and including the turbine stop valves; and
- piping and components in the drain lines from the portion of the main steam lines described above on to the condenser.

These components are reviewed as listed below.

Table 2.3.4-2 lists the component types that require aging management review.

Table 3.4.2-2 provides the results of the aging management review.

License Renewal Drawings

License renewal drawings for the main condenser and MSIV leakage pathway are listed in Section 2.3.4.4.

2.3.4.3 Turbine-Generator and Auxiliaries

System Description

The purpose of the turbine-generator and auxiliaries system is to convert a portion of the thermal energy contained in the steam from the reactor to electric energy and to provide extraction steam and moisture for feedwater heating.

The turbine-generator system includes the turbine, generator, exciter, controls, and required auxiliary systems described below.

The turbine bypass system (TBS) dissipates the energy of main steam generated by the reactor which cannot be used by the turbine. The TBS consists of three automatically operated regulating valves which permit steam flow to the condenser, bypassing the turbine.

The turbine sealing system (TSS) prevents air leakage into, or steam leakage out of the turbine by automatically sealing with steam the turbine shaft glands and the valve stems (main stop, control, intercept, and bypass valves). The TSS consists of the steam seal pressure regulator, steam seal header, gland seal condenser, two full capacity exhaust blowers, and the associated piping and valves.

Turbine lube oil provides lubrication to the journal and thrust bearings of the main turbine-generator shaft and serves as the hydraulic medium for the turbine control system.

The hydrogen seal oil system minimizes hydrogen losses at the generator shaft and removes non-condensable gas and moisture to maximize hydrogen purity.

The generator gas control system is used to maintain proper hydrogen pressure in the generator.

Stator cooling water provides cooled, low-conductivity water to the generator stator bars (armature windings) and generator field rectifiers to remove heat. The system consists of two pump trains, a storage tank, and two heat exchangers.

Isolated phase bus cooling uses two heat exchangers to provide cooling to the isolated phase busses.

The turbine-generator and auxiliaries system has no intended functions for 10 CFR 54.4(a)(1) or (a)(3)

The turbine-generator and auxiliaries 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.
- Provide holdup and plate-out of fission products. This function is performed by components in the MSIV leakage pathway (turbine bypass system).

<u>UFSAR References</u>

Sections 11.2, 11.4.3.2, and 11.5

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

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).

The following turbine-generator and auxiliaries system components are in the MSIV leakage pathway:

- piping and components in the turbine bypass from the main steam lines to the condenser.

These components are reviewed as listed below.

Table 2.3.4-2 lists the component types that require aging management review.

Table 3.4.2-2 provides the results of the aging management review.

<u>License Renewal Drawings</u>

License renewal drawings for the main condenser and MSIV leakage pathway are listed in Section 2.3.4.4.

2.3.4.4 Main Condenser

The purpose of the main condenser is to provide a heat sink for the turbine exhaust steam, turbine bypass steam, and other flows such as heater drains, air ejector intercondenser drain, gland seal condenser drain, feedwater heater shell operating vents, and condensate pump suction vents. It also provides deaeration and storage capacity for the condensate which is reused after a period of radioactive decay. Main condenser vents and drains provide a flow path for drains from various systems back to the condenser.

The main condenser is a twin shell, horizontal tube, seawater cooled unit. To permit a two-minute decay period of the condensed steam, the condenser hotwells are equipped with baffling arranged to form labyrinths.

The main condenser has no intended functions for 10 CFR 54.4(a)(1).

The main condenser has the following intended functions for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.
- Provide holdup and plate-out of fission products.

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

UFSAR References

Sections 11.3, 11.4, 14.5.1.3

Components Subject to Aging Management Review

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).

The following main condenser components are in the MSIV leakage pathway:

- portions of the main condenser required to retain the MSIV leakage, including the condenser shell, hotwells, tubes, tubesheets, waterboxes, and expansion joints.

These components are reviewed as listed below.

Table 2.3.4-2 lists the component types that require aging management review.

Table 3.4.2-2 provides the results of the aging management review.

License Renewal Drawings

Additional details for components in the main condenser and MSIV leakage pathway subject to aging management review are provided in the following license renewal drawings.

LRA-M-203 Sheet 1
LRA-M-203 Sheet 3
LRA-M-210
LRA-M-226 Sheet 1
LRA-M-252 Sheet 1

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

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

Table 2.3.4-2
Main Condenser and MSIV Leakage Pathway
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Condenser	Plateout
Condenser (tubes)	Plateout
Expansion joint	Plateout
Orifice	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

Structures within the scope of license renewal are primary containment (Section 2.4.1), the reactor building (Section 2.4.2), the intake structure (Section 2.4.3), process facilities (emergency diesel generator building, main stack and filter building, radwaste building, turbine building) (Section 2.4.4), and various yard structures (Section 2.4.5). Structural commodities (piping and conduit supports, electrical cabinets, tank foundations, etc.) are addressed in the bulk commodities review (Section 2.4.6).

2.4.1 Primary Containment

Description

The primary containment limits the release of fission products in the event of a postulated design basis accident (DBA) so that offsite doses would not exceed the values specified in 10 CFR 100. Primary containment is located inside the reactor building.

The primary containment is a General Electric Mark I containment consisting of a drywell (which encloses the reactor vessel and the recirculation system), a pressure suppression chamber (commonly known as the torus) and a connecting vent system. When operating at power, the containment is flooded with nitrogen to preclude the availability of oxygen.

The drywell surrounds the reactor vessel and primary systems. The torus, a toroidal structure containing water, is located below the drywell. The vent system connecting the drywell to the torus terminates below the water surface. Access is provided by the steel drywell head and the personnel hatch located on it as well as a double door air lock, equipment hatch, and one control rod drive access hatch.

Concrete floor slabs, structural steel floors, and platforms are provided inside the drywell as required.

The design of the primary containment conforms to the applicable codes or specifications listed in UFSAR Section 12.2.

The major structural components of primary containment are described below.

Drywell

The drywell is a carbon steel structure enclosed in reinforced concrete founded on bedrock. Above the transition zone between the spherical and cylindrical portions, the drywell is separated from the reinforced concrete by a two-inch gap. This gap allows for drywell thermal expansion. Shielding over the top of the drywell is provided by removable, segmented, reinforced concrete shield plugs located on the reactor building refuel floor. The reinforced concrete drywell floor contains the drywell floor drain and equipment drain sumps, and supports the reactor pedestal.

Torus

The torus is a toroidal-shaped carbon steel pressure vessel below and encircling the drywell. The torus is anchored to the reinforced concrete foundation slab of the reactor building.

Reactor Vessel and Drywell Bellows

The reactor vessel refueling bulkhead assembly has two bellows constructed of stainless steel. The bellows have backing plates, spring seals, and removable guard rings. The drywell to reactor building bellows assembly is similar to the reactor vessel refueling bulkhead bellows assembly.

Sacrificial Shield Wall

The sacrificial shield wall is a high density, steel reinforced, concrete cylindrical structure surrounding the vessel. The concrete is contained by inner and outer steel liner plate that are also used to attach various system supports.

The 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. Lateral support for the shield wall is provided by eight pairs of stabilizers. The stabilizers consist of steel pipes welded to the top of the shield wall and bolted to fittings on the primary containment wall.

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.
- Provide support, shelter, and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. Primary containment houses equipment credited for fire protection (10 CFR 50.48).
- Provide a heat sink during a design basis accident.
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

UFSAR References

Sections 5.1.2, 5.2.3

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect system components, mechanical piping or electrical lines. Structural commodities that are unique to primary containment are included in this review. Those that are common to PNPS 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 2.4.6).

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 Reactor Building

Description

The purpose of the reactor building is to contain airborne fission products, in the event of a design basis accident, such that leakage of these fission products to the environment will be within the dose limits specified in 10 CFR 100 and to support and protect the reactor and associated systems.

The reactor building completely encloses the primary containment. It also houses the refueling facilities, spent fuel storage pool, steam separator and dryer storage pool, new fuel storage vault, and control rod drive hydraulic equipment. The reactor building is seismic Class I and safety-related except for the reactor building trucklock and portions of the reactor auxiliary bay which do not house safety-related equipment. Nonsafety-related refueling equipment is required to maintain structural integrity such that safety functions are not affected.

The reactor building is seismic Class I, constructed of monolithic reinforced concrete floors and walls to the refueling level. Exterior walls above the refueling level, consists of steel framing and precast concrete wall panels with structural steel bracing. Exterior walls below the refueling floor are reinforced concrete with precast panels on the exterior face. The roof is an insulated steel deck system supported by structural steel framing and bracing. In areas requiring missile protection, the metal decking is covered with a reinforced concrete slab. The siding and roofing can withstand a limited internal overpressure before pressure relief is obtained by venting through blowout panels.

A biological shield wall, which is an integral part of the reactor building, encircles the primary containment. This shield wall protects the containment vessel and the reactor system against potential missiles generated external to primary containment and provides shielding to reduce dose to personnel.

The new fuel storage vault and new fuel storage racks provide a dry location for upright storage of new fuel assemblies which allows efficient handling of the assemblies during station operations. The new fuel storage vault is a reinforced concrete seismic Class 1 structure, accessible only through top hatches. Each new fuel storage rack is designed as a seismic Class I structure.

The spent fuel storage pool, the reactor well, and the steam separator and dryer storage pool consist of reinforced concrete deep girder walls and base slabs. The pools are lined with stainless steel plates on their inside surface. Interconnected drainage monitoring channels are provided behind the liner welds.

The spent fuel racks are free standing. Nine racks are made up of welded stainless steel assemblies in the shape of cruciforms, angles, and tees. The remaining racks are made up of welded stainless steel boxes.

The reactor building bridge crane services the reactor and refueling area. The reactor building bridge crane is designed seismic Class II. The crane supports are designed seismic Class I. The crane bridge and trolley wheels are provided with seismic holddown lugs to assure crane stability in the event of a maximum hypothetical earthquake.

The reactor building has 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. The reactor building houses equipment credited for anticipated transients without scram (10 CFR 50.62), and for fire protection (10 CFR 50.48).
- Provide secondary containment.
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

<u>UFSAR References</u>

Sections 5.2, 5.3, 12.2

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

Structural commodities are structural members that support or protect system components, mechanical piping or electrical lines. Structural commodities that are unique to the reactor building are included in this review. Those that are common to PNPS 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 2.4.6).

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 Intake Structure

Description

The purpose of the intake structure is to support and protect equipment that draws water from the intake canal. The intake structure is a seismic Class II structure with the exception of the south-central chambers (SSW bays and pump rooms) that house the ASME Class 1 SSW pumps and associated piping. The intake structure houses the salt service water system pumps, the circulating water system pumps, fire protection system pumps, the chlorination system equipment, stop logs, trash racks, and the traveling screens with their wash pumps.

The intake structure consists of a steel-framed superstructure covered by precast concrete panels that rests upon a reinforced concrete substructure whose foundation rests on undisturbed soil. The superstructure primarily houses equipment associated with the circulating water (CW) and the salt service water (SSW) systems while the substructure provides a flow path for bay water to reach the suction piping of these systems. Reinforced concrete wingwalls extend outward from the front (north) corners of the structure to form the connection between the intake canal and the substructure.

Precast concrete panels cover the external walls, and the galvanized steel roof is built-up over metal decking and rigid insulation. The SSW pump room exterior walls and ceiling are reinforced concrete. Masonry block walls divide the SSW pump room into three compartments (east, west, and north). Interior walls surrounding the hypochlorite tank and pump are also masonry.

The intake structure has 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. Areas in the intake structure house equipment credited for fire protection (10 CFR 50.48).

UFSAR References

Section 12.2

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect system components, mechanical piping or electrical lines. Structural commodities that are unique to the intake structure are included in this review. Those that are common to PNPS 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 2.4.6).

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 Process Facilities

Description

Process facilities are buildings and structures related to power generation and supporting processes. They are designated as either seismic Class I or seismic Class II. Concrete floor slabs with structural steel framing are provided inside these facilities as required. Support for these structures is provided by concrete or structural steel columns, supported by base slabs and waits.

Process facilities with intended functions for license renewal are described below.

Emergency Diesel Generator Building

The purpose of the emergency diesel generator building is to support and protect the emergency diesel generators (EDGs) and associated equipment. The seismic Class I building is a reinforced concrete structure with steel framing.

The diesel generator building has a reinforced concrete foundation mat founded on compacted structural backfill. The foundation is reinforced concrete wall footings which are separated from the diesel generator foundation blocks. The walls are reinforced concrete with precast reinforced concrete panels on the exterior face. The roof is a reinforced concrete slab supported by structural steel framing.

Main Stack and Filter Building

The purpose of the main stack is to ensure an elevated release of radioactivity which has passed through the appropriate filtration systems. The main stack is supported by the filter building, which is a reinforced concrete structure housing the nonsafety-related dilution fans, offgas filters, and heaters.

The main stack is a steel pipe approximately 400 feet tall located 700 feet NW of the reactor building. The main stack is a safety-related and seismic Class I structure but is not designed to withstand tornado loadings since it is located sufficiently far from other seismic Class 1 structures to preclude interaction.

The main stack and filter building structure foundation rests on undisturbed, dense, relatively incompressible sand, gravel, and cobbles.

Radwaste Building

The purpose of the radwaste building is to support and protect the radioactive waste treatment equipment, the control room, the cable spreading and computer room, a post-accident sampling station, a warehouse, and miscellaneous offices and shops. The building houses safety-related equipment. The control room, cable spreading room, and post accident sampling station are designated as seismic Class I.

The radwaste building is a reinforced concrete structure with structural steel framing. The radwaste building's reinforced concrete foundation mat rests partially on undisturbed, dense, relatively incompressible sand, gravel, and cobbles, and partially on compacted structural backfill. This structure has a waterproof membrane designed to prevent or minimize ground water in-leakage. Elevated floors are concrete slabs supported on structural steel framing. Interior walls are reinforced concrete or concrete block. Exterior walls are reinforced concrete below grade, and in the seismic Class I areas above grade. Other above-grade exterior walls consists of structural steel columns and bracing with precast concrete wall panels. The roof is an insulated steel deck system supported by structural steel framing. In areas requiring missile protection, the metal decking is covered with a reinforced concrete slab.

Turbine Building

The purpose of the turbine building, with its auxiliary bays, is to support and protect the turbine generator and associated auxiliaries. The turbine building houses the condensate and feedwater systems, switchgear (including safety-related switchgear), some radwaste system components, the turbine building crane, and other auxiliary equipment.

The turbine building is a rigid steel structure with precast concrete siding. Areas housing switchgear rooms A and B and the protected portion housing the standby gas treatment system trains are seismic Class I.

Since radioactive steam enters the turbine building from the reactor during normal plant operation, radiation shielding is provided in affected areas.

The foundation is a reinforced concrete mat stiffened by the basement walls. The turbine building rests on compacted structural backfill and is protected below grade by a waterproof membrane designed to prevent or minimize ground water in-leakage. Elevated floors are concrete slabs supported on structural steel framing. The interior walls are reinforced concrete or concrete block. The turbine pedestal is a heavily reinforced concrete structure resting on the concrete foundation. Exterior walls consist of structural steel columns and bracing with precast concrete wall panels. The roof is an insulated steel deck system supported by structural steel framing and bracing.

Process facilities 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. Process facilities house equipment credited for fire protection (10 CFR 50.48).
- Provide for an elevated release (main stack and filter building).

UFSAR References

Sections 12.2, 12.3

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect system components, mechanical piping or electrical lines. Structural commodities that are unique to the process facilities are included in this review. Those that are common to PNPS 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 2.4.6).

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.

2.4.5 Yard Structures

Description

Yard structures are structures at PNPS not contained within primary containment, the reactor building, the intake structure, or process facilities.

A brief description of yard structures within the scope of license renewal is provided below.

Tank Foundations

The purpose of the condensate storage tank foundations is to support the condensate storage tanks (T-105A/B). The condensate storage tanks sit on a sand cushion with a concrete ring wall foundation. The tank bottom flange and ring wall interface has concrete grout at the external edge.

The purpose of the underground fuel oil tank foundations is to support the EDG fuel oil tanks (T-126A/B) and the SBO diesel generator fuel oil tanks (T-160A/B). Fuel oil storage tanks T-126A/B rest on compacted sand beds with hold down rods connected to a one-foot-thick reinforced concrete foundation mat. Fuel oil storage tanks T-160A/B rest on compacted pea gravel beds with hold down rods connected to a one-foot-thick reinforced concrete foundation mat.

The purpose of the fire water storage tank foundations is to support the fire water storage tanks (T-107A/B). The foundations are not seismic Class I structures. The tanks sit on a sand cushion with a concrete ring wall foundation. The tank bottom flange and ring wall interface has concrete grout at the external edge.

Security Diesel Generator Building

The purpose of the security diesel generator building is to support and protect the security diesel generator and its auxiliary equipment, which is credited in the 10 CFR 50 Appendix R analysis (10 CFR 50.48). The building is not safety-related and is not a seismic Class I structure. The security diesel generator building is a pre-fabricated steel structure with a reinforced concrete foundation.

Station Blackout (SBO) Diesel Generator Building

The purpose of the SBO diesel generator enclosure is to support and protect plant equipment associated with the SBO diesel generator. The SBO diesel generator is mounted on a skid and housed in a pre-engineered enclosure for protection from the environment. The enclosure is not a seismic Class I structure.

Transformers Foundations

The purpose of the transformer foundations is to support the 345kv switchyard startup transformer X4 and the 23kv transformer yard shutdown transformer X13 required for recovery from station blackout. The transformers are anchored to the foundations. The foundations are non-seismic Class I structures constructed of reinforced concrete.

Switchyard Relay House and Switchyard Structural Components

The purpose of the switchyard terminal (relay) house is to support and protect the control, monitoring and protective relaying for the 345kV switching station equipment. The structure houses control components for the electrical equipment required to support recovery from station blackout.

The switchyard relay house rests on a poured concrete foundation mat. The building exterior is constructed with precast concrete panels and steel roof decking.

The purpose of the switchyard structural steel components is to support the offsite power system that provides the electrical interconnections between the offsite transmission network and the station startup transformer, which is required to recover offsite power following station blackout.

Trenches, Valve Pits, Manholes and Duct Banks

The purpose of the trenches, valve pits, manholes and duct banks located throughout the PNPS site is to support and protect plant equipment. Trenches, valve pits, manholes and duct banks that shelter or support equipment in the scope of license renewal are also in scope. Trenches that are within the scope of license renewal are the condensate storage tanks and fire water storage tanks pipe trenches and the offgas piping trench, which includes the 20-inch underground vent duct required for the standby gas treatment system. Valve pits are provided for the condensate storage tanks and fire water storage tanks. Duct banks are provided for routing electrical cables between buildings and in the switchyard area. Manholes are provided to access underground diesel fuel oil storage tanks, valve pits and duct banks. These structural components are constructed of reinforced and non-reinforced concrete.

Breakwaters, Jetties, and Revetments

The purpose of the breakwaters is to protect the intake structure and revetments from excessive wave action and overtopping due to wave run-up, to prevent rapid silting of the dredged channels, and to limit storm flooding of the site. The onshore stone revetments on either side of the intake structure provide shore stabilization and prevent flooding of the reactor building during severe storms. They are designed to act as a second line of defense in conjunction with the breakwaters such that any overtopping that might occur under the extreme design storm tide level would not affect the reactor building or the emergency systems required to safeguard the reactor. Short jetties provide protection of the outlet channel and discharge structure.

The main breakwater is seismic Class I. The east breakwater, jetties, and revetments are not seismic Class I. The breakwaters, jetties, and revetments are of rubble mound (rip-rap) construction with the outer layer protected by heavy capstone.

Discharge Structure

The purpose of the discharge structure is to provide a flow path from the circulating water system and the salt service water system back to the bay. The discharge structure is located near the shoreline, northwest of the intake structure.

The structure is classified as nonsafety-related and is not a seismic Class I structure. The discharge structure is part of the salt service water system flow path to the ultimate heat sink.

The discharge structure is a box-shaped concrete seal well constructed on backfill and undisturbed soil. This concrete mass structure, unlike the intake structure with floors, walls and building interiors, is analogous to the design of a building sump well.

The breakwaters, jetties and revetments have the following intended functions for 10 CFR 54.4(a)(1), (a)(2), and (a)(3).

- Protect the intake structure and revetment from excessive wave action and overtopping due to wave run-up, to prevent rapid silting of the dredged channels, and to limit storm flooding of the site.
- Provide protection of the outlet channel and discharge structure.
- Provide shore stabilization and prevent flooding of the reactor building during severe storms.
- Protect the suction and discharge for the salt service water system, which is credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

Remaining yard structures 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. Yard structures house and support equipment credited for station blackout (10 CFR 50.63) and for fire protection (10 CFR 50.48).
- Maintain integrity of the SSW discharge flow path (discharge structure and channel). The SSW system is credited for fire protection (10 CFR 50.48).

UFSAR References

Section 2.4.4.1 (breakwaters, jetties, and revetments; discharge structure and channel). Section 8.2 describes unit and preferred ac power sources.

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect system components, mechanical piping or electrical lines. Structural commodities that are unique to the in-scope yard structures are included in this review. Those that are common to PNPS 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 2.4.6). Structural supports for switchyard components (equipment supports, equipment pads) are evaluated with the bulk commodities.

Table 2.4-5 lists the component types that require aging management review.

Table 3.5.2-5 provides the results of the aging management review.

2.4.6 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 2.4.5). Bulk commodities common to PNPS in-scope SSCs (e.g., anchors, embedments, component and piping 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 2.4-6 lists the component types that require aging management review.

Table 3.5.2-6 provides the results of the aging management review.

Table 2.4-1
Primary Containment
Components Subject to Aging Management Review

Component	Intended Function[1]
Steel and Other Metals	
Bellows (reactor vessel and drywell)	Pressure boundary Support for Criterion (a)(1) equipment
CRD removal hatch	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Drywell head	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Drywell shell	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Drywell sump screen	Support for Criterion (a)(1) equipment
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 hatch	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Jet deflectors	Missile barrier Support for Criterion (a)(1) equipment
Personnel airlock	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Primary containment electrical penetrations	Pressure boundary Support for Criterion (a)(1) equipment

Table 2.4-1
Primary Containment
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Primary containment mechanical penetrations (includes those w/bellows)	Pressure boundary Support for Criterion (a)(1) equipment
Reactor vessel support assembly	Support for Criterion (a)(1) equipment
Reactor vessel stabilizer supports	Support for Criterion (a)(1) equipment
Sacrificial shield wall lateral supports	Support for Criterion (a)(1) equipment
Sacrificial shield wall (steel portion)	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Structural steel: plates, columns and beams	Support for Criterion (a)(1) equipment
Torus electrical penetrations	Pressure boundary Support for Criterion (a)(1) equipment
Torus external supports (columns, saddles)	Support for Criterion (a)(1) equipment
Torus manway	Pressure boundary Support for Criterion (a)(1) equipment
Torus mechanical penetrations	Pressure boundary Support for Criterion (a)(1) equipment
Torus ring girders	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
Concrete	
Drywell sump	Flood barrier Support for Criterion (a)(1) equipment
Equipment hatch concrete plug	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment

Table 2.4-1
Primary Containment
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Floor slabs, walls	Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Floor slabs, walls (EQ Zone 1.30, Drywell El. 9’-2”)	Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Foundation	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Reactor vessel support pedestal	Support for Criterion (a)(1) equipment
Sacrificial shield wall (concrete portion)	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Elastomers and other materials	
Primary containment electrical penetration seals and sealant	Pressure boundary Support for Criterion (a)(1) equipment
Fluoropolymers and Lubrite Sliding Supports	
Lubrite sliding supports	Support for Criterion (a)(1) equipment

1. Intended functions are defined in Table 2.0-1.

Table 2.4-2
Reactor Building
Components Subject to Aging Management Review

Component	Intended Function[1]
Steel and Other Metals	
Blowout or blow-off panels	Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Equipment lock	Fire barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Metal partition walls	Fire barrier Shelter or protection
Metal siding	Pressure boundary Shelter or protection
New fuel storage racks	Shelter or protection Support for Criterion (a)(1) equipment
Reactor building crane, rails, and girders	Support for Criterion (a)(2) equipment
Refueling platform	Support for Criterion (a)(2) equipment
Roof framing and insulated metal decking	Shelter or protection Support for Criterion (a)(2) equipment
Spent fuel pool liner plate and gates	Shelter or protection Support for Criterion (a)(1) equipment
Spent fuel pool storage racks	Support for Criterion (a)(1) equipment
Structural steel: beams, columns, plates, trusses	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Concrete	
Beams, columns, floor slabs, and interior walls	Fire barrier Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment

Table 2.4-2
Reactor Building
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Biological shield wall	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Exterior walls	Fire barrier Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Foundations	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)(1) equipment
Spent fuel pool bottom slab and walls	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Sump	Support for Criterion (a)(1) equipment
Water trough	Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment

1. Intended functions are defined in Table 2.0-1.

Table 2.4-3
Intake Structure
Components Subject to Aging Management Review

Component	Intended Function[1]
Steel and Other Metals	
Baseplates, fasteners and supports	Shelter or protection Support for Criterion (a)(2) equipment
Metal roof decking	Shelter or protection Support for Criterion (a)(2) equipment
Structural steel: beams, columns, plates	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Concrete	
Beams, columns, floor slabs, interior walls	Fire barrier Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Exterior walls	Fire barrier Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Foundations	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Masonry walls	Fire barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Pump bays	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment

Table 2.4-3
Intake Structure
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Roof slabs	Fire barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Skimmer wall	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Sump	Support for Criterion (a)(2) equipment

1. Intended functions are defined in Table 2.0-1.

Table 2.4-4
Process Facilities
Components Subject to Aging Management Review

Component	Intended Function[1]
Steel and Other Metals	
Blowout or blow-off panels	Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Control room ceiling support system	Support for Criterion (a)(2) equipment
Crane rails and girders	Support for Criterion (a)(2) equipment
Main stack	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Main stack guy wires	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Metal partition walls	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Roof framing and insulated metal decking	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Structural steel: beams, columns, plates	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Concrete	
Beams, columns, floor slabs, interior walls	Fire barrier Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Exterior walls	Fire barrier Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment

Table 2.4-4
Process Facilities
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Foundations	Flood barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Interior walls (control room envelope)	Fire barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Main stack chimney	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Main stack guy wire deadman	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Masonry walls	Fire barrier Missile 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 Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Shield walls and plugs	Shelter or protection
Sumps	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment

1. Intended functions are defined in Table 2.0-1.

Table 2.4-5
Yard Structures
Components Subject to Aging Management Review

Component	Intended Function[1]
Steel and Other Metals	
SBO diesel generator enclosure	Shelter or protection Support for Criterion (a)(3) equipment
Security diesel generator building	Shelter or protection Support for Criterion (a)(3) equipment
Structural steel: beams, columns, plates, trusses	Shelter or protection Support for Criterion (a)(3) equipment
Switchyard relay house	Shelter or protection Support for Criterion (a)(3) equipment
Concrete	
Beams, columns, floor slabs, interior walls	Shelter or protection Support for Criterion (a)(3) equipment
Discharge structure	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Duct banks	Shelter or protection
Exterior walls	Shelter or protection Support for Criterion (a)(3) equipment
Foundations (switchyard relay house, tanks, SBO diesel generator, security diesel generator building, transformers)	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Manholes	Shelter or protection
Sumps	Support for Criterion (a)(2) equipment
Trenches	Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Valve pits	Shelter or protection Support for Criterion (a)(3) equipment

Table 2.4-5
Yard Structures
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Rip Raps and Capstone	
Breakwaters, jetties, and revetments	Flood barrier Shelter or protection Support for Criterion (a)(2) equipment

1. Intended functions are defined in Table 2.0-1.

Table 2.4-6
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
Cable trays	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 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
Components and piping supports	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Conduits	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Conduit supports	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Damper framing	Fire barrier
Electrical and Instrument panels and enclosures	Shelter or protection 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

Table 2.4-6
Bulk Commodities
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Flood curbs	Flood barrier Shelter or protection
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
Manway 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
Penetration sleeves (mechanical/ electrical not penetrating primary containment structure 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
Stairways, handrails, platforms, grating, decking, and ladders	Support for Criterion (a)(2) equipment

Table 2.4-6
Bulk Commodities
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Vents and louvers	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Threaded Fasteners	
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 support 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
Manway hatches and hatch covers	Fire barrier Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Missile shields	Missile barrier
Support pedestals	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Elastomers and other materials	
Building pressure boundary sealant	Pressure boundary

Table 2.4-6
Bulk Commodities
Components Subject to Aging Management Review
(Continued)

Component	Intended Function[1]
Compressible joints and seals	Support for Criterion (a)(2) equipment
Fire stops	Fire barrier Pressure boundary
Fire wraps	Fire barrier
Insulation	Insulation Support for Criterion (a)(2) equipment
Penetration sealant (fire rated, 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
Seismic joint filler	Fire barrier 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 systems are included in the scope of license renewal as are electrical and instrumentation and control (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 PNPS and the offsite transmission network. The system also provides the electrical interconnections between the offsite network and the station auxiliary buses, as well as other buildings and facilities on site.

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 instrumentation and control (I&C) components in mechanical systems.

The offsite power sources required to support SBO recovery actions are the sources fed through the startup transformer (X4) and the shutdown transformer (X13). Specifically, the path includes the switchyard circuit breakers feeding the startup and shutdown transformers, the startup transformer and shutdown transformer, 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, PNPS 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 not subject to 10 CFR 50.49 EQ requirements
- electrical cables and connections subject to 10 CFR 50.49 EQ requirements
- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits
- fuse holders - insulation material
- fuse holders - metallic clamp
- inaccessible medium-voltage (4.16kV to 22kV) 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
- 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.

- Transmission conductors are not required for recovery from an SBO and are not required for other license renewal intended functions.
- 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)	CE
Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	CE
Electrical cables not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits	CE
Fuse holders (insulation material)	IN
High voltage insulators	IN
Inaccessible medium-voltage (4.16kV to 22kV) cables (e.g., installed underground in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	CE
Metal enclosed bus (non-segregated bus for SBO), connections	CE
Metal enclosed bus (non-segregated bus for SBO), insulation /insulators	IN
Metal enclosed bus—enclosure assemblies	SRE
Switchyard bus	CE

1. Intended functions are defined in Table 2.0-1.

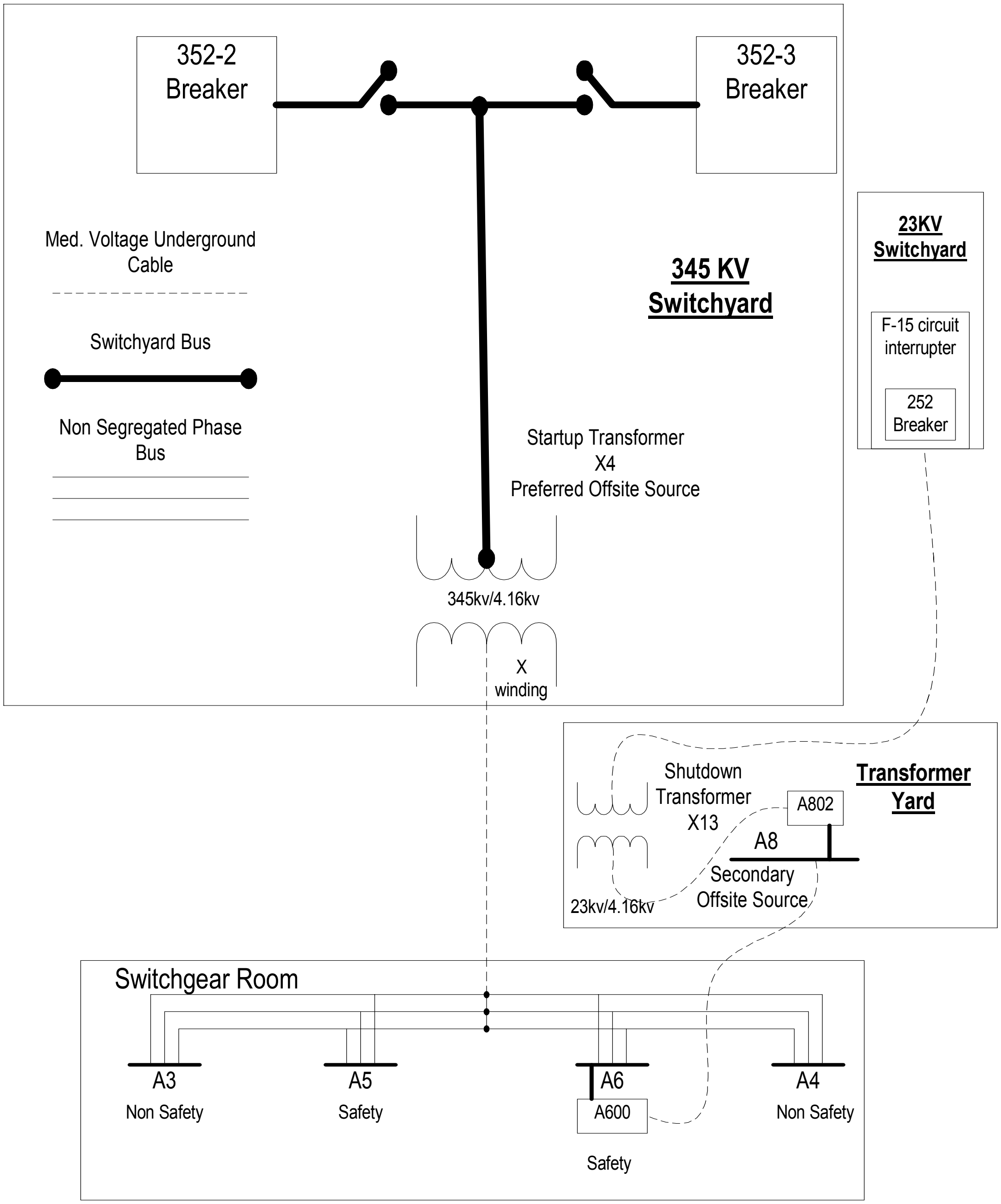

Figure 2.5-1
SBO Offsite Power Scoping Diagram

3.0 AGING MANAGEMENT REVIEW RESULTS

This section provides the results of the aging management reviews (AMRs) 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 two types of tables as described below.

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 enhanced for license renewal.

To take full advantage of NUREG-1801, 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 3.x.1, also referred to as Table 1, and Table 3.x.2-y, also referred to as Table 2.

- **Table 3.x.1** where

  3 indicates the table pertaining to a Chapter 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 section, this is Table 3.1.1, and in the engineered safety features section, this is Table 3.2.1. For ease of discussion, these table types will hereafter be referred to as "Table 1." These tables are derived from the corresponding tables in NUREG-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 section, the AMR results for the reactor vessel are presented in Table 3.1.2-1, and the results for the reactor vessel internals are in Table 3.1.2-2. In the engineered safety features subsection, the residual heat removal system results are presented in Table 3.2.2-1, and the containment spray system is in Table 3.2.2-2. For ease of discussion, these table types will hereafter be referred to as "Table 2." These tables present the results of the AMRs.

Table 1

The purpose of Table 1 is to provide a summary comparison of how the 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.

<u>Table 2</u>

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 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. Column 7 is left blank if there is no corresponding item number in NUREG-1801, Volume 2, for a particular combination of factors.

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, and
- aging management program.

Table 1 Item

Column 8 lists the corresponding line item from Table 1. Column 8 is left blank if there is no corresponding item in NUREG-1801, Volume 1.

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 NEI 95-10 (Reference 3.0-3). Notes that use numeric designators are specific to PNPS.

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 PNPS evaluations and programs 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:

- 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.

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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
Treated water > 220°F	Treated or demineralized water above thermal fatigue threshold for carbon steel. Steam is considered treated water.
Treated water > 270°F	Treated or demineralized water above thermal fatigue 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
Air—outdoor	Exposed to air and local weather conditions
Air—treated	Air that is dried and filtered but is subject to condensation unless monitored by the instrument air quality program
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

Table 3.0-1
Service Environments for Mechanical Aging Management Reviews
(Continued)

Environment	Description
Freon	Freon gas used in HVAC equipment (control room chiller)
Fuel oil	Fuel oil such as used for combustion engines, boilers, etc.
Gas	Inert gas such as carbon dioxide, Freon, Halon, nitrogen, etc.
Lube oil	Lubricating oil for plant equipment
Nitrogen	Nitrogen gas
Raw water	Raw, untreated fresh or salt water
Sand and concrete	Sand and concrete base for tanks
Silicone	Silicone (torus wide range level transmitter remote diaphragm seals)
Sodium pentaborate solution	Sodium pentaborate solution (SLC system)
Soil	External environment for components buried in the soil, including groundwater in the soil
Steam > 220°F	Steam above the thermal fatigue threshold for carbon steel
Steam > 270°F	Steam above the thermal fatigue threshold for stainless steel
Treated water	Treated or demineralized water[1]
Treated water > 140°F	Treated water above the SCC threshold for stainless steel
Treated water > 220°F	Treated water above the thermal fatigue threshold for carbon steel
Treated water > 270°F	Treated water above the thermal fatigue threshold for stainless steel
Treated water > 482°F	Treated water above the thermal embrittlement threshold for CASS
Untreated water	Water that may contain contaminants, including oil or boric acid, depending on the location; includes originally treated water that is not monitored by a chemistry program

1. For the aging management review process, and the Table 2 presentation of review results, "treated water" encompasses a range of water "types," all of which were chemically treated or demineralized. These water types include treated water, reactor coolant and closed cycle cooling water as defined in NUREG-1801. In the Table 2 results, the type of water can normally be inferred from the context of the result (e.g., if water chemistry control - closed 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 PNPS 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.
Moisture and voltage stress	A wetted environment with applied voltage > 2kV. Applies to underground medium-voltage cables energized at least 25% of the time.
Outdoor weather	Ambient outdoor conditions including precipitation

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
- low alloy steel

- low alloy steel with partial (SS) cladding
- low alloy steel with stainless steel (SS) cladding
- nickel-based alloy
- stainless steel

Environment

Reactor vessel components are exposed to the following environments.

- air—indoor
- neutron fluence
- treated water > 220ºF
- treated water > 270ºF

Aging Effects Requiring Management

The following aging effects associated with the reactor vessel components require management.

- cracking
- cracking—fatigue
- loss of material
- reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the effects of aging on reactor vessel components.

- BWR CRD Return Line Nozzle
- BWR Feedwater Nozzle
- BWR Penetrations
- BWR Stress Corrosion Cracking
- BWR Vessel ID Attachment Welds
- BWR Vessel Internals
- Inservice 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 > 270ºF
- treated water > 482ºF

Aging Effects Requiring Management

The following aging effects associated with the reactor vessel internals components require management.

- cracking
- cracking—fatigue
- cracking—flow-induced vibration (FIV)
- loss of material
- loss of preload
- reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the effects of aging on reactor vessel internals components.

- BWR Vessel Internals
- 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
- cast austenitic stainless 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 > 220ºF
- treated water > 270ºF
- treated water > 482ºF

Aging Effects Requiring Management

The following aging effects associated with the reactor coolant pressure boundary components require management.

- cracking
- cracking—fatigue
- loss of material
- reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the effects of aging on reactor coolant pressure boundary components.

- BWR Stress Corrosion Cracking
- Flow-Accelerated Corrosion
- Inservice Inspection
- One-Time Inspection
- System Walkdown
- 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 PNPS approach to those areas requiring further evaluation. Programs are described in Appendix B.

3.1.2.2.1 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). The evaluation of fatigue for the reactor vessel and the reactor internals is discussed in Sections 4.3.1.1 and 4.3.1.2, respectively. The evaluation of fatigue as a TLAA for the Class 1 portions of the reactor coolant boundary piping and components, including those for interconnecting systems is discussed in Section 4.3.1.3. Section 4.3.3 addresses environmental effects for Class 1 components.

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 vessel exposed to reactor coolant is managed at PNPS 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. The Inservice Inspection Program supplements the Water Chemistry Control - BWR Program for these components.

2. This paragraph in NUREG-1800 pertains to BWR isolation condenser components. PNPS 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. For some components, the Inservice Inspection Program supplements the Water Chemistry Control - BWR Program.

3. Loss of material due to general, pitting, and crevice corrosion in stainless steel, nickel-alloy and steel with stainless steel cladding components of the reactor vessel, and loss of material in stainless steel (including CASS) components of the reactor coolant pressure boundary exposed to reactor coolant is managed at PNPS 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. The One-Time Inspection Program is also used to manage loss of material for the main steam flow restrictors by means of a component specific inspection. For some components, the Inservice Inspection or BWR Vessel Internals Program supplements the Water Chemistry Control - BWR Program.

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 of fracture toughness due to neutron embrittlement of reactor vessel beltline materials. PNPS 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 vessel (RV) 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 and One-Time Inspection Programs will manage cracking due to SCC and IGSCC in the stainless steel head seal leak detection lines. The One-Time Inspection Program will include a volumetric examination for the detection of cracking.

2. This paragraph in NUREG-1800 pertains to BWR isolation condenser components. PNPS does not have an isolation condenser.

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. At PNPS, these lines have no license renewal intended function and thus are not subject to aging management review.

   The jet pump instrumentation provides indication of jet pump flow. As the jet pump flow is not a safety related function, indication of that flow is not a license renewal function. The lines inside the vessel do not contribute to the pressure boundary. The lines outside the vessel are part of the RCS pressure boundary and are subject to aging management review.

2. This paragraph in NUREG-1800 pertains to BWR isolation condenser components. PNPS does not have an isolation condensate.

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. The BWR Vessel Internals Program incorporates the guidelines of GE-SIL-644, Revision 1. PNPS will evaluate BWRVIP-139 upon approval by the NRC staff and either include its recommendations in the PNPS BWR Vessel Internals Program or inform the staff of PNPS's exceptions to that document.

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 PNPS quality assurance procedures and administrative controls for aging management programs.

3.1.2.3 Time-Limited Aging Analyses

TLAA identified for the reactor coolant system include reactor vessel neutron embrittlement and metal fatigue. These topics are addressed in Section 4.

3.1.3 Conclusion

The reactor vessel, internals and reactor coolant system components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21. The aging management programs selected to manage aging effects for the reactor vessel, internals and reactor coolant system components are identified in the following tables and Section 3.1.2.1. A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging associated with the 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

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 Section 3.1.2.2.1
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				

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-7	PWR only				
3.1.1-8	PWR only				
3.1.1-9	PWR only				
3.1.1-10	PWR only				
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. These components also credit the Inservice Inspection Program to manage loss of material. See Section 3.1.2.2.2 item 1.
3.1.1-12	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 PNPS 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. For some components, the Inservice Inspection Program is also credited with managing loss of material. See Section 3.1.2.2.2 item 2.

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
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 cladding 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. For some components, the Inservice Inspection Program is also credited with managing loss of material. See Section 3.1.2.2.2 item 3.

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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. The One-Time Inspection Program is also used to manage loss of material for the main steam flow restrictors by means of a component specific inspection. For some components, the Inservice Inspection Program is also credited with managing loss of material. 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 (Continued)					
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 of 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 (Continued)					
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. PNPS 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				

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-24	PWR only				
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" nominal pipe size (NPS) and cracking of these lines is addressed by line 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. PNPS 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				

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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.
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.

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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 and nickel-alloy nozzles and penetrations in the reactor vessel is managed by the Water Chemistry Control – BWR and either the BWR Penetrations or BWR Vessel Internals Programs.

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)

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 and Inservice Inspection or One-Time Inspection Programs.
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 and nickel-alloy vessel attachment welds exposed to reactor coolant.

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
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 (Continued)					
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 PNPS 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 - BWR 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 Control - BWR Program augmented by the One-Time Inspection Program is consistent with other items of this table including line Items 3.1.1-14 and 3.1.1-15.

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
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 Water Chemistry Control – BWR Program. The One-Time Inspection Program, which is consistent with the 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 One-Time Inspection Program is credited. The Inservice Inspection Program is also credited for those components > 4" NPS that are compared to this line item. Inservice inspection is not applicable to components < 4" NPS. Lines that reference this item use either One-Time Inspection or Inservice Inspection but not both as listed in NUREG-1801, so note E is used.

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
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	PNPS has welded access hole covers with a 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. The BWR Vessel Internals Program augments the Inservice Inspection Program and includes either access hole cover visual examination every 8 years or ultrasonic examination every 12 years.
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 for the head closure flange bolting. The Reactor Head Closure Studs Program manages cracking in low alloy steel head closure flange bolting. The Inservice Inspection Program manages cracking in other low allow steel pressure boundary bolting.

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 Embrittlement of 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 (Continued)					
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 of the incore housing is managed by the Inservice Inspection Program. The ISI programs provides for visual and volumetric examinations of the bolting in accordance with ASME section XI IWB which is consistent with the NUREG-1801 Reactor Head Closure Studs 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 PNPS is standard grade B7 carbon steel, or similar material, except in rare specialized applications such as applications 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,

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-52 continued					Section II, Part D, Table 4. No PNPS 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. 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. To address these bolting operational concerns, PNPS 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 PNPS.

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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.
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.

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 Program manages 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.

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
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. PNPS has no other Class 1 piping, piping components, piping elements, or CRD housings made of CASS. Pump casings and valve bodies of CASS are included in line Item 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				
3.1.1-69	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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				

Table 3.1.1: Reactor Coolant System, NUREG 1801 Vol. 1 (Continued)

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. High component surface temperature precludes moisture accumulation that could result in corrosion.

102. The environment of air - indoor (external) is considered to be equivalent to the NUREG-1801 generic line R-28 environment of System temperature up to 288°C (550°F) for the purposes of evaluating cracking due to fatigue.

103. The PNPS 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.

104. Cracking of the head seal leak detection line is included in this line item.

105. 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.

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**
Bolting								
Closure flange studs, nuts, washers and bushings.	Pressure boundary	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, 105
				Cracking	Reactor Head Closure Studs	IV.A1-9 (R-60)	3.1.1-50	B
Incore housing bolting • Flange • Nut and washer • Flange bolts	Pressure boundary	Stainless steel	Air-indoor (ext)	Cracking – fatigue	TLAA—metal fatigue			G
				Cracking	Inservice Inspection	IV.A2-6 (R-78)	3.1.1-52	E
Other pressure boundary bolting • Upper head flange bolts and nuts • CRD flange bolting	Pressure boundary	Low alloy steel	Air-indoor (ext)	Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	C, 105
				Cracking	Inservice Inspection	IV.A1-9 (R-60)	3.1.1-50	E

Table 3.1.2-1: Reactor Vessel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heads and Shell								
Dome • Bottom head	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR			H
			Air-indoor (ext)	None	None			G, 101
Dome • Upper closure head	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR			H
			Air-indoor (ext)	None	None			G, 101

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Flanges • Shell closure flange • Upper head closure flange	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR			H
			Air-indoor (ext)	None	None			G, 101
Vessel shell • Beltline shell	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR			H
			Neutron fluence	Reduction of fracture toughness	TLAA—neutron fluence	IV.A1-13 (R-62)	3.1.1-17	A
					Reactor Vessel Surveillance	IV.A1-14 (R-63)	3.1.1-18	A
			Air-indoor (ext)	None	None			G, 101

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Vessel shell • Intermediate nozzle shell • Lower shell • Upper shell	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR			H
			Air-indoor (ext)	None	None			G, 101
Nozzles and Penetrations								
CRD housings	Pressure boundary	Stainless steel	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-8 (RP-25)	3.1.1-14	C
				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 (Continued)								
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	Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-8 (RP-25)	3.1.1-14	A
				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
Incore housings	Pressure boundary	Stainless steel	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-8 (RP-25)	3.1.1-14	A
				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	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzles • Recirc outlets (N1) • Recirc inlets (N2)	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				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, 101
Nozzles • Main steam (N3)	Pressure boundary	Low alloy steel with partial SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-11 (R-59)	3.1.1-11	C
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR			H
			Air-indoor (ext)	None	None			G, 101

Table 3.1.2-1: Reactor Vessel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Nozzles • Feedwater (N4)	Pressure boundary	Low alloy steel with partial SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-11 (R-59)	3.1.1-11	C
				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, 101
Nozzles • Core spray (N6) • Spare head spray (N7A) • Spare head inst. (N7B) • Head vent (N8) • Jet pump inst. (N9)	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				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, 101

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzles CRD return (N10)	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking - fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR CRD Return Line Nozzle	IV.A1-2 (R-66)	3.1.1-38	B
			Air-indoor (ext)	None	None			G, 101
Nozzles • Drain (N11)	Pressure boundary	Carbon steel	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-11 (R-59)	3.1.1-11	C
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
			Air-indoor (ext)	None	None			G, 101

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzles • Head seal leakoff (N12, N13)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	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
Nozzles • SLC/ΔP (N14) • Reactor vessel instrumentation (N15, N16)	Pressure boundary	Nickel-based alloy	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-8 (RP-25)	3.1.1-14	A
				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	B
			Air-indoor (ext)	None	None	IV.E-1 (RP-03)	3.1.1-85	A

Table 3.1.2-1: Reactor Vessel (Continued)

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, caps and flanges								
Cap • CRD return (N10)	Pressure boundary	Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				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
Flanges • Spare head spray (N7A) • Spare head inst. (N7B) • Blank flanges (N7A, N7B) • Head vent (N8)	Pressure boundary	Low alloy steel	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-11 (R-59)	3.1.1-11	C
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
			Air-indoor (ext)	None	None			G, 101

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Safe ends • Recirc outlet (N1) • Recirc inlet (N2)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-8 (RP-25)	3.1.1-14	A
				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
Safe ends • Feedwater (N4) • Main steam (N3)	Pressure boundary	Low alloy steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-11 (R-59)	3.1.1-11	C
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
			Air-indoor (ext)	None	None			G, 101

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Safe ends • Core spray (N6) • Jet pump inst. (N9)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-8 (RP-25)	3.1.1-14	A
				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
Safe ends • SLC/ΔP (N14)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection	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 (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Safe ends • Reactor vessel instrumentation (N15, N16)	Pressure boundary	Nickel alloy	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection	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
Thermal sleeves • Recirc inlet (N2) • Feedwater (N4) • Core spray (N6)	Pressure boundary	Stainless steel	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	C
				Cracking – fatigue	TLAA—metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-13 (R-100)	3.1.1-44	D

Table 3.1.2-1: Reactor Vessel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Vessel attachments and supports								
ID attachment welds • Core spray pads • Dryer holddown pads • Dryer support pads • FW sparger pads • Guide rod pads • Jet pump riser brace pads • Surv. holder pads	Pressure boundary	Stainless steel	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-8 (RP-25)	3.1.1-14	A
				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
ID attachments • Shroud support pad	Support for Criterion (a)(1) equipment	Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.A1-8 (RP-25)	3.1.1-14	A
				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 (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Supports • Stabilizer pads • Support skirt	Support for Criterion (a)(1) equipment	Carbon steel Low alloy 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

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 Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Control rod guide tubes • Tube	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 270 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				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	D
Control rod guide tubes • Base	Support for Criterion (a)(1) equipment	CASS	Treated water > 482 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				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	D
			Treated water > 482° F and neutron fluence	Reduction of fracture toughness	Thermal Aging Embrittlement of CASS	IV.B1-9 (R-103)	3.1.1-51	A

Table 3.1.2-2: Reactor Vessel Internals (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Core plate assembly • Plate, beams, alignment assemblies • Alignment bolts/nuts • Wedges	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 270 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA—metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-6 (R-93)	3.1.1-44	B
Core plate assembly • Rim bolts	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 270 °F	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-6 (R-93)	3.1.1-44	B
Core spray lines	Flow distribution	Stainless steel	Treated water > 270 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA—metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-7 (R-99)	3.1.1-44	B

Table 3.1.2-2: Reactor Vessel Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
SLC/ΔP line	Flow distribution	Stainless steel	Treated water > 270 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA—metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-7 (R-99)	3.1.1-44	D
Fuel support pieces • Four lobed	Support for Criterion (a)(1) equipment	CASS	Treated water > 482 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA—metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-6 (R-93)	3.1.1-44	D
			Treated water > 482 °F and neutron fluence	Reduction of fracture toughness	Thermal Aging Embrittlement of CASS	IV.B1-9 (R-103)	3.1.1-51	A

Table 3.1.2-2: Reactor Vessel Internals (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Incore dry tubes	Pressure boundary	Stainless steel	Treated water > 270 °F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA—metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-10 (R-105)	3.1.1-44	B
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Incore guide tubes	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 270 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA—metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-10 (R-105)	3.1.1-44	B

Table 3.1.2-2: Reactor Vessel Internals (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Jet pump assemblies • Transition piece • Suction inlet elbow and nozzle • Mixer flange and flare • Diffuser collar	Floodable volume	CASS	Treated water > 482 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA—metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-13 (R-100)	3.1.1-44	B
			Treated water > 482 °F and neutron fluence	Reduction of fracture toughness	Thermal Aging Embrittlement of CASS	IV.B1-9 (R-103)	3.1.1-51	C

Table 3.1.2-2: Reactor Vessel Internals (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Jet pump assemblies • Riser pipe, elbow, and brace • Holddown beam • Holddown bolt • Mixer throat • Restrainer bracket and wedge assemblies • Diffuser shell, tailpipe, and top adapter • Diffuser bottom adapter	Floodable volume	Stainless steel Nickel-based alloy	Treated water > 270 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA—metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-13 (R-100)	3.1.1-44	B

Table 3.1.2-2: Reactor Vessel Internals (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Shroud	Floodable volume	Stainless steel	Treated water > 270 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				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 repair hardware • Tie rod assemblies • Stabilizer springs • Wedges	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 270 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				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

Table 3.1.2-2: Reactor Vessel Internals (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Shroud support • Ring • Access hole covers	Support for Criterion (a)(1) equipment	Nickel-based alloy	Treated water > 270 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				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 dryer	Structural integrity	Stainless steel	Treated water > 270 °F	Cracking - FIV	BWR Vessel Internals	IV.B1-16 (RP-18)	3.1.1-29	E
Top guide	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 270 °F	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA—metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-17 (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 Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting (flanges, valves, etc.)	Pressure boundary	Stainless steel	Air-indoor (ext)	Cracking – fatigue	TLAA—metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A, 105
				Cracking	Inservice Inspection			F
		Low alloy steel	Air-indoor (ext)	Loss of material	System Walkdown Inservice Inspection	V.E-7 (E-44)	3.2.1-31	C
				Cracking – fatigue	TLAA—metal fatigue	IV.C1-11 (R-28)	3.1.1-4	A, 102
				Cracking	Inservice Inspection			H
Condensing chambers	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 103
				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 (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Detector (CRD)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 103
				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
Drive (CRD)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection	IV.C1-1 (R-03)	3.1.1-48	E
				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
Driver mount (RR)	Pressure boundary	Carbon steel	Air-indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	C

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Filter housing (CRD)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 103
				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
Flow elements (RR)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				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 (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Orifices (Instrumen-tation)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 103
				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 (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping and fittings < 4" NPS (instrumen-tation, vent, and drains)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking – fatigue	TLAA—metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
				Cracking	Water Chemistry Control – BWR	IV.C1-1 (R-03)	3.1.1-48	E, 103
					One-Time Inspection	IV.A1-10 (R-61)	3.1.1-19	E, 104
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C
				Cracking – fatigue	TLAA—metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None			I, 101

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping and fittings < 4” NPS (instrumentation, vent, and drains)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 103
			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
			Air-indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	C
Piping and fittings < 4” NPS (CRDH)	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 (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping and fittings ≥ 4” NPS	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking – fatigue	TLAA—metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-6 (R-16)	3.1.1-13	C
					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)	None	None			I, 101

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**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 Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
			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 Inservice Inspection	IV.C1-6 (R-16)	3.1.1-13	C
			Air-indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	C

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing and cover (RR)	Pressure boundary	CASS	Treated water > 482°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				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
				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 (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump cover • Thermal barrier (RR)	Pressure boundary	CASS	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water Inservice Inspection	V.D2-5 (E-19)	3.2.1-28	D
				Cracking	Water Chemistry Control – Closed Cooling Water Inservice Inspection	V.D-2-26	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 > 482 °F (int)	Loss of material	Water Chemistry Control – BWR One-Time Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	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
				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 (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**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	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 103
			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 (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Thermowell < 4" NPS (all systems)	Pressure boundary	Stainless steel	Treated water > 270° F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 103
				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
Thermowell ≥ 4" NPS (all systems)	Pressure boundary	Stainless steel	Treated water > 270° F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				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 (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve bodies < 4” NPS	Pressure boundary	Stainless steel	Treated water > 270 °F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking – fatigue	TLAA—metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 103
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve bodies < 4" NPS	Pressure boundary	CASS	Treated water > 482 °F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking – fatigue	TLAA—metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 103
				Reduction of fracture toughness	One-Time 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
		Carbon steel	Treated water > 220 °F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C
				Cracking – fatigue	TLAA—metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None			I, 101

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve bodies < 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
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 103
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		CASS	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 103
			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
			Air-indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	D

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve bodies < 4" NPS	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
Valve bodies ≥ 4" NPS	Pressure boundary	Stainless steel (forging)	Treated water > 270 °F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking – fatigue	TLAA—metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve bodies ≥ 4" NPS	Pressure boundary	CASS	Treated water > 482 °F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking – fatigue	TLAA—metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
				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
Valve bodies ≥ 4" NPS	Pressure boundary	Carbon steel	Treated water > 220 °F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-6 (R-16)	3.1.1-13	C
					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)	None	None			I, 101

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve bodies ≥ 4" NPS	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve bodies ≥ 4” NPS	Pressure boundary	CASS	Treated water (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
			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 Inservice Inspection	IV.C1-6 (R-16)	3.1.1-13	C
			Air-indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	C

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 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 gas treatment system (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 (RHR) System—Summary of Aging Management Evaluation
- Table 3.2.2-2 Core Spray (CS) System—Summary of Aging Management Evaluation
- Table 3.2.2-3 Automatic Depressurization (ADS) System—Summary of Aging Management Evaluation
- Table 3.2.2-4 High Pressure Coolant Injection (HPCI) System—Summary of Aging Management Evaluation
- Table 3.2.2-5 Reactor Core Isolation Cooling (RCIC) System—Summary of Aging Management Evaluation
- Table 3.2.2-6 Standby Gas Treatment (SGT) System—Summary of Aging Management Evaluation

- Table 3.2.2-7 Primary Containment Penetrations (PCP) —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 System

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
- nitrogen
- treated water
- treated water > 140º F
- treated water > 220º F
- treated water > 270º 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.

- Heat Exchanger Monitoring
- Selective Leaching
- System Walkdown
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Cooling Water

3.2.2.1.2 Core Spray System

Materials

Core spray system components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc
- stainless steel

Environment

Core spray system components are exposed to the following environments.

- air—indoor
- lube oil
- treated water

Aging Effects Requiring Management

The following aging effects associated with the core spray system require management.

- fouling
- loss of material
- loss of material—erosion
- loss of material—wear

Aging Management Programs

The following aging management programs manage the effects of aging on the core spray system components.

- Heat Exchanger Monitoring
- Oil Analysis

- Selective Leaching
- System Walkdown
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Cooling Water

3.2.2.1.3 Automatic Depressurization System

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 > 220°F
- steam > 270°F
- 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.

- Periodic Surveillance and Preventive Maintenance
- System Walkdown
- Water Chemistry Control – BWR

3.2.2.1.4 High Pressure Coolant Injection System

Materials

High pressure coolant injection system components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc
- copper alloy > 15% zinc (inhibited)
- nickel alloy
- stainless steel

Environment

High pressure coolant injection system components are exposed to the following environments.

- air—indoor
- air—untreated
- lube oil
- steam > 220°F
- steam > 270°F
- 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.

- Flow-Accelerated Corrosion
- Heat Exchanger Monitoring
- Oil Analysis
- Periodic Surveillance and Preventive Maintenance

- System Walkdown
- Water Chemistry Control – BWR

3.2.2.1.5 Reactor Core Isolation Cooling System

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
- lube oil
- treated water
- treated water > 140°F
- steam > 270°F

Aging Effects Requiring Management

The following aging effects associated with the reactor core isolation cooling system require management.

- cracking
- cracking—fatigue
- fouling
- loss of material
- loss of material—wear

Aging Management Programs

The following aging management programs manage the effects of aging on the reactor core isolation cooling system components.

- Heat Exchanger Monitoring
- Oil Analysis
- Periodic Surveillance and Preventive Maintenance
- System Walkdown

- Water Chemistry Control – BWR

3.2.2.1.6 Standby Gas Treatment System

Materials

Standby gas treatment system components are constructed of the following materials.

- carbon steel
- copper alloy
- copper alloy < 15% zinc
- copper alloy > 15% zinc
- elastomer
- stainless steel

Environment

Standby gas treatment system components are exposed to the following environments.

- air—indoor
- air—treated
- soil
- raw water

Aging Effects Requiring Management

The following aging effects associated with the standby gas treatment system require management.

- change in material properties
- cracking
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on the standby gas treatment system components.

- Buried Piping and Tanks Inspection
- Instrument Air Quality
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- System Walkdown

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.

- Containment Leak Rate
- System Walkdown
- 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. Section 3.2.2.2 of NUREG-1800 discusses these aging effects and other issues that require further evaluation. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the PNPS approach to these areas requiring further evaluation. Programs are described in Appendix B.

3.2.2.2.1 Cumulative Fatigue Damage

PNPS aging management reviews do not consider cumulative fatigue damage (cracking-fatigue) a concern for steel or stainless steel unless the system temperature exceeds 220°F or 270°F, respectively. 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 Cracking due to Underclad Cracking

This item covers underclad cracking of cladding on PWR steel pump casings. PNPS is a BWR and does not have charging pumps or steel pump casings with stainless steel cladding. This item is not applicable to PNPS.

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 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 including areas of stagnant flow.

2. At PNPS there are no stainless steel ESF components that are in contact with a soil environment. This item is therefore not applicable.

3. Loss of material from pitting and crevice corrosion for BWR stainless steel piping and piping components exposed to treated water at PNPS is managed by the Water Chemistry Control – BWR Program. ESF systems at PNPS do not contain any components made of aluminum. 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. Loss of material from pitting and crevice corrossion 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. Operating experience at PNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

5. Loss of material from pitting and crevice corrossion could occur for partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. At PNPS there are no outdoor stainless steel tanks in ESF systems. This item is therefore not applicable.

6. At PNPS there are no components in ESF systems that are exposed to internal condensation. This item is therefore not applicable.

3.2.2.2.4 Reduction of Heat Transfer due to Fouling

1. Reduction of heat transfer due to fouling for stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil in ESF systems at PNPS 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 fouling. Operating experience at PNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that fouling has not and will not affect the intended functions of these components.

2. Reduction of heat transfer due to fouling for stainless steel heat exchanger tubes exposed to treated water in ESF systems at PNPS 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.

3.2.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

The Periodic Surveillance and Preventive Maintenance Program manages aging in elastomer components of the standby gas treatment system exposed to air. The program includes periodic visual or other nondestructive inspections and manipulations to manage cracking and changes in material properties.

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. PNPS 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 PNPS the spray nozzles are copper alloy and stainless steel and are not subject to loss of material due to general corrosion in an indoor air environment. There are also no orifices in ECCS 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 at PNPS 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. The Periodic Surveillance and Preventive Maintenance Program will also be used to manage loss of material for ADS system piping wetted in the waterline region of the torus.

2. Steel containment isolation components exposed to treated water are all part of other safety systems that are evaluated separately. Section 3.2.2.2.8.1 above describes the detection of aging effects in these components. As stated above, the loss of material due to general, pitting and crevice corrosion for internal surfaces of primary containment penetrations steel piping and components exposed to treated water is managed at PNPS 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 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. Operating experience at PNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

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 and piping components buried in soil in ESF systems at PNPS 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.

3.2.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of PNPS quality assurance procedures and administrative controls for aging management programs.

3.2.2.3 Time-Limited Aging Analyses

The only time-limited aging analysis (TLAA) 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 the following tables and Section 3.2.2.1. A description of these aging management programs is provided in Appendix B of the LRA, 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 of the LRA, 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.
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	Not applicable. No stainless steel components in the ESF systems are exposed to soil. See Section 3.2.2.2.3 item 2.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 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 (Continued)					
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 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	Not applicable. There are no internal stainless steel surfaces exposed to condensation in ESF systems. See Section 3.2.2.2.3 item 6.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 stainless steel and copper alloy heat exchanger tubes. There are no steel heat exchanger tubes exposed to lube oil in the ESF systems. See Section 3.2.2.2.4 item 1.
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.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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)	The Periodic Surveillance and Preventive Maintenance Program manages cracking and changes in material properties in elastomer components of the standby gas treatment system exposed to air. See Section 3.2.2.2.5.
3.2.1-12	PWR only				
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.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 will also be used to manage loss of material for ADS system piping wetted in the waterline region of the torus. See Section 3.2.2.2.8 item 1.
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	Not applicable. Steel containment isolation components exposed to treated water are all part of other safety systems that are evaluated separately. 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. See Section 3.2.2.2.8 item 3.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)

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. There are no buried tanks in the ESF systems. 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 theBWR Stress Corrosion Cracking Program (all relevant components are included in the reactor vessel, internals and reactor coolant systems). The One-Time Inspection will be used to verify the effectiveness of the water chemistry program.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)					
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	Consistent with NUREG-1801 for steel piping exposed to steam in the HPCI system. The Flow-Accelerated Corrosion Program manages wall thinning in steel piping. For steel piping exposed to steam in the RCIC system, loss of material is managed by the Periodic Surveillance and Preventive Maintenance Program. This program includes periodic non-destructive evaluations to identify wall thinning, thereby managing loss of material due to erosion for this piping
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.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 line Item 3.2.1-23).
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	The System Walkdown Program manages the loss of material for steel bolting through the use of visual inspections that are performed at least once per refueling cycle.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)					
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 PNPS is standard grade B7 carbon steel, or similar material, except in rare specialized applications such as applications 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 PNPS 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. To address these bolting operational concerns, PNPS has taken actions to address NUREG–1339,

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-24 continued					"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 PNPS.
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 for stainless steel components.
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 all part of other safety systems that are evaluated separately.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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.
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	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages reduction of heat transfer for stainless steel and copper alloy heat exchanger tubes.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 System Walkdown Program manages loss of material for external surfaces of steel components.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)					
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 System Walkdown, Periodic Surveillance and Preventive Maintenance, and One-Time Inspection Programs. The System Walkdown 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 surfaces condition will be representative of internal surfaces. Thus, loss of material on internal carbon steel surfaces is also managed by the System Walkdown 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 (Continued)					
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 Periodic Surveillance and Preventive Maintenance Program manages loss of material for steel components exposed internally to condensation (untreated air in the standby gas treatment 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 and Containment Leak Rate Programs manages the 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	Not applicable. There are no steel heat exchanger components exposed to raw water in the ESF systems.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)					
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	Not applicable. There are no stainless steel components exposed to raw water in the ESF systems.
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 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	Not applicable. There are no stainless steel heat exchanger components exposed to raw water in the ESF systems.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)

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	Not applicable. There are no steel or stainless 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 components of copper alloy > 15% zinc.
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	Not applicable. There are no gray cast iron components exposed to closed cycle cooling water in the ESF systems.
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.

Table 3.2.1: Engineered Safety Features, NUREG 1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801. The Selective Leaching Program will manage loss of material due to selective leaching for gray cast iron components exposed to treated water.
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	Not applicable. There are no aluminum components in the ESF 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 (Continued)					
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. External surfaces of stainless steel and copper alloy components exposed to indoor air have no significant aging effects. This finding is also applicable to the internal surfaces of stainless steel and copper alloy spray nozzles
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 (Continued)					
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 of the 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.
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 environment of air - untreated (int) includes moisture with the potential for condensation on the internal surfaces of the components.

202. This piping is subject to loss of material due to erosion similar to flow accelerated corrosion, hence the comparison to NUREG-1801 generic line E-07. The Periodic Surveillance and Preventive Maintenance Program includes periodic non-destructive evaluations to identify wall thinning, thereby managing loss of material due to erosion for this piping.

203. This component is part of a separate instrument air subsystem which is dedicated to the standby gas treatment system.

Table 3.2.2-1
Residual Heat Removal System (RHR)
Summary of Aging Management Evaluation

Table 3.2.2-1: Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Condensing pot	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Condensing pot	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Condensing pot	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Condensing pot	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Cyclone separator	Pressure boundary and filtration	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Cyclone separator	Pressure boundary and filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.2.2-1: Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (bonnets)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	V.D2-7 (E-17)	3.2.1-27	B
Heat exchanger (bonnets)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 270º F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 270º F (int)	Cracking - fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	V.A-18 (E-43)	3.2.1-44	C
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Air indoor – (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140º F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	V.D2-5 (E-19)	3.2.1-28	B

Table 3.2.2-1: Residual Heat Removal System (Continued)								
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 > 140º F (int)	Cracking	Water Chemistry Control – Closed Cooling Water	V.D2-26 (EP-44)	3.2.1-25	D
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270º F (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270º F (ext)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270º F (ext)	Loss of material – wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270º F (ext)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (int)	Fouling	Water Chemistry Control – Closed Cooling Water	V.D2-10 (EP-35)	3.2.1-30	B
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water > 270º F (ext)	Fouling	Water Chemistry Control – BWR	V.D2-13 (EP-34)	3.2.1-10	A
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	Treated water > 270º F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Orifice	Pressure boundary	Stainless steel	Treated water > 270º 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 (Continued)								
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 > 270° F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Orifice	Flow control Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Orifice	Flow control Pressure boundary	Carbon steel	Treated water > 220° F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Orifice	Flow control Pressure boundary	Carbon steel	Treated water > 220° F (int)	Cracking - fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Orifice	Flow control Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Orifice	Flow control Pressure boundary	Stainless steel	Treated water > 270° F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Orifice	Flow control Pressure boundary	Stainless steel	Treated water > 270° 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 (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Flow control Pressure boundary	Stainless steel	Treated water > 270° F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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
Piping	Pressure boundary	Carbon steel	Treated water > 220° F (int)	Cracking - fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
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 > 140° F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
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
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Pump casing	Pressure boundary	Carbon steel	Treated water > 220° F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Pump casing	Pressure boundary	Carbon steel	Treated water > 220° F (int)	Cracking - fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	A

Table 3.2.2-1: Residual Heat Removal System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Spray header	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Spray header	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Spray header	Pressure boundary	Carbon steel	Nitrogen – (int/)/ (ext)	None	None	V.F-18 (EP-7)	3.2.1-56	A
Spray header	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Spray nozzles	Flow control Pressure boundary	Copper alloy > 15% Zn	Air – indoor (int)/(ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Spray nozzles	Flow control Pressure boundary	Copper alloy > 15% Zn	Nitrogen (int)/ (ext)	None	None	V.F-4 (EP-9)	3.2.1-56	A
Spray nozzles	Flow control Pressure boundary	Stainless steel	Air – indoor (int)/ (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Spray nozzles	Flow control Pressure boundary	Stainless steel	Nitrogen (int)/ (ext)	None	None	V.F-15 (EP-22)	3.2.1-56	A
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.2.2-1: Residual Heat Removal System (Continued)

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
Thermowell	Pressure boundary	Stainless steel	Treated water > 270º F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 270º F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Thermowell	Pressure boundary	Stainless steel	Treated water > 270º F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
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 > 270º F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Tubing	Pressure boundary	Stainless steel	Treated water > 270º F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Tubing	Pressure boundary	Stainless steel	Treated water > 270º F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A

Table 3.2.2-1: Residual Heat Removal System (Continued)								
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	V.D2-33 (E-08)	3.2.1-14	A
Valve body	Pressure boundary	Carbon steel	Treated water > 220º F (int)	Cracking - fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
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 (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.2.2-2
Core Spray System (CS)
Summary of Aging Management Evaluation

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	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Cooling coil	Heat transfer	Copper alloy > 15% Zn	Lube oil (ext)	Fouling	Oil Analysis	V.D2-9 (EP-47)	3.2.1-9	E
Cooling coil	Heat transfer	Copper alloy > 15% Zn	Treated water (int)	Fouling	Water Chemistry Control – Closed Cooling Water	V.A-11 (EP-39)	3.2.1-30	D
Cooling coil	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Cooling coil	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material – wear	Heat Exchanger Monitoring			H
Cooling coil	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	V.D2-3 (EP-13)	3.2.1-29	B
Cooling coil	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	V.D2-4 (EP-37)	3.2.1-41	A

Table 3.2.2-2: Core Spray System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Cooling coil	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material - erosion	Heat Exchanger Monitoring			H
Cyclone separator	Pressure boundary and filtration	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Cyclone separator	Pressure boundary and filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Orifice	Pressure boundary and flow control	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Orifice	Pressure boundary and flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A

Table 3.2.2-2: Core Spray System (Continued)								
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 – BWR	V.D2-33 (E-08)	3.2.1-14	A
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
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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

Table 3.2.2-3
Automatic Depressurization System (ADS)
Summary of Aging Management Evaluation

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	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C
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
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
Piping	Pressure boundary	Carbon steel	Steam > 220°F (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	Water Chemistry Control – BWR Periodic Surveillance and Preventive Maintenance	V.D2-33 (E-08)	3.2.1-14	A

Table 3.2.2-3: Automatic Depressurization System (Continued)								
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	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Tee-quenchers (submerged)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Tee-quenchers (submerged)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Tee-quenchers (submerged)	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			G
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A

Table 3.2.2-4
High Pressure Coolant Injection System (HPCI)
Summary of Aging Management Evaluation

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	System Walkdown	V.D2-2 (E-26)	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	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Blower housing	Pressure boundary	Carbon steel	Air—untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-17 (E-27)	3.2.1-34	E, 201
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
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
Drain pot	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)

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 > 220°F (int)	Cracking – fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Drain pot	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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
Gear box housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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	System Walkdown	V.D2-2 (E-26)	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
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)

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	System Walkdown	V.D2-2 (E-26)	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn (inhibited)	Treated water > 140°F (ext)	Fouling	Water Chemistry Control – BWR	VIII.E-10 (SP-58)	3.4.1-9	C
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn (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% Zn (inhibited)	Treated water > 140°F (int)	Fouling	Water Chemistry Control – BWR	VIII.E-10 (SP-58)	3.4.1-9	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn (inhibited)	Treated water > 140°F (ext)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn (inhibited)	Treated water > 140°F (ext)	Loss of material – wear	Heat Exchanger Monitoring			H

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
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 (inhibited)	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn (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% Zn (inhibited)	Lube oil (ext)	Loss of material – wear	Heat Exchanger Monitoring			H
Orifice	Pressure boundary & flow control	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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
Orifice	Pressure boundary & flow control	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Orifice	Pressure boundary & flow control	Stainless steel	Steam > 270°F (int)	Cracking – fatigue	TLAA-metal fatigue			G

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)

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 > 270°F (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
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
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Pilot valve housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Pilot valve housing	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	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
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	V.D2-30 (EP-46)	3.2.1-16	E
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-31 (E-07)	3.2.1-19	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
Piping	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Piping	Pressure boundary	Carbon steel	Air—untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-17 (E-27)	3.2.1-34	E, 201
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 > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
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 > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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 > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	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
Rupture disc	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Rupture disc	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Rupture disc	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
Rupture disc	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Rupture disc	Pressure boundary	Stainless steel	Steam > 270°F (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 (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Rupture disc	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Rupture disc	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			G
Steam trap	Pressure boundary	Carbon steel	Air – Indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
Strainer	Filtration	Stainless steel	Treated water (int) and (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Strainer	Filtration	Stainless steel	Steam > 220°F (int) and (ext)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C
Strainer	Filtration	Stainless steel	Steam > 220°F (int) and (ext)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Strainer	Filtration	Nickel alloy	Steam > 270°F (int) and (ext)	Loss of material	Water Chemistry Control – BWR			G
Strainer	Filtration	Nickel alloy	Steam > 270°F (int) and (ext)	Cracking	Water Chemistry Control – BWR			G

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer	Filtration	Nickel alloy	Steam > 270°F (int) and (ext)	Cracking - fatigue	TLAA-metal fatigue			G
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Strainer housing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
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	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Strainer housing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			G
Strainer housing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	C
Tank	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 (Continued)								
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	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	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
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	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Thermowell	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
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Thermowell	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1-24 (EP-51)	3.2.1-6	E
Thermowell	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis			H
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	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

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
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	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	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 > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			G
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (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 > 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
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1-24 (EP-51)	3.2.1-6	E
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis			H

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Turbine casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Turbine casing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Turbine casing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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 > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	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	A
Valve body	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Valve body	Pressure boundary	Copper Alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
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

Table 3.2.2-5
Reactor Core Isolation Cooling System (RCIC)
Summary of Aging Management Evaluation

Table 3.2.2-5: 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	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
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
Condenser shell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Condenser shell	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C
Drain pot	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Drain pot	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Drain pot	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
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	System Walkdown	V.D2-2 (E-26)	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
Governor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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 (tubes)	Heat transfer	Copper alloy > 15% Zn (inhibited)	Lube oil (ext)	Fouling	Oil Analysis	V.D2-9 (EP-47)	3.2.1-9	E

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
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 (inhibited)	Treated water > 140°F (int)	Fouling	Water Chemistry Control – BWR	VIII.E-10 (SP-58)	3.4.1-9	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn (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% Zn (inhibited)	Lube oil (ext)	Loss of material – wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn (inhibited)	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Orifice	Pressure boundary & flow control	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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
Orifice	Pressure boundary & flow control	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
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 > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			G
Orifice	Pressure boundary & flow control	Stainless steel	Steam > 270°F (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
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
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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 > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
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 > 270°F (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-31 (E-07)	3.2.1-19	E, 202
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
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
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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
Pump casing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
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

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
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	System Walkdown	V.D2-2 (E-26)	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
Steam trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Steam trap	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Steam trap	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
Strainer	Filtration	Stainless steel	Treated water (int) and (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Strainer	Filtration	Stainless steel	Steam > 270°F (int) and (ext)	Cracking - fatigue	TLAA-metal fatigue			G
Strainer	Filtration	Stainless steel	Steam > 270°F (int) and (ext)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Strainer housing	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
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	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	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	A
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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 > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	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
Thermowell	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)

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 > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			G
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (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
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
Turbine casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Turbine casing	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Turbine casing	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
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	System Walkdown	V.D2-2 (E-26)	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 > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	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	A
Valve body	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
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

Table 3.2.2-6
Standby Gas Treatment System (SGT)
Summary of Aging Management Evaluation

Table 3.2.2-6: Standby Gas Treatment System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Copper alloy	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	V.F-12 (EP-18)	3.2.1-53	C
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.B-3 (E-26)	3.2.1-31	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Ductwork	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.B-3 (E-26)	3.2.1-31	A
Ductwork	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Ductwork	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Ductwork	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G

Table 3.2.2-6: Standby Gas Treatment System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Expansion joint	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	Periodic Surveillance and Preventive Maintenance	V.B-4 (E-06)	3.2.1-11	E
Expansion joint	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	Periodic Surveillance and Preventive Maintenance	V.B-4 (E-06)	3.2.1-11	E
Expansion joint	Pressure boundary	Elastomer	Air – indoor (int)	Cracking	Periodic Surveillance and Preventive Maintenance	V.B-4 (E-06)	3.2.1-11	E
Expansion joint	Pressure boundary	Elastomer	Air – indoor (int)	Change in material properties	Periodic Surveillance and Preventive Maintenance	V.B-4 (E-06)	3.2.1-11	E
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.B-3 (E-26)	3.2.1-31	A
Fan housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.B-3 (E-26)	3.2.1-31	A

Table 3.2.2-6: Standby Gas Treatment System (Continued)								
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	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Orifice	Pressure boundary & flow control	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.B-3 (E-26)	3.2.1-31	A
Orifice	Pressure boundary & flow control	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
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	Air – indoor (int)	None	None			G
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.B-3 (E-26)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	One-Time Inspection	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E

Table 3.2.2-6: Standby Gas Treatment System (Continued)

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 (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.C-5 (E-22)	3.2.1-35	E
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	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	V.B-9 (E-42)	3.2.1-17	B
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	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
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G
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	Air – indoor (int)	None	None			G

Table 3.2.2-6: Standby Gas Treatment System (Continued)								
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 < 15% Zn	Treated air (int)	Loss of material	Instrument Air Quality	VII.G-9 (AP-78)	3.3.1-28	E, 203
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.B-3 (E-26)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E
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	Treated air (int)	Loss of material	Instrument Air Quality	VII.G-9 (AP-78)	3.3.1-28	E, 203

Table 3.2.2-7
Primary Containment Penetrations (PCP)
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 Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – Indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
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	System Walkdown	V.C-1 (E-35)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Air – Indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	V.F-18 (EP-7)	3.2.1-56	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Containment Leak Rate	V.C-5 (E-22)	3.2.1-35	E
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
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C-4 (E-33)	3.2.1-3	A

Table 3.2.2-7: Primary Containment Penetrations (Continued)								
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	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
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
Valve body	Pressure boundary	Carbon steel	Air – Indoor (ext)	Loss of material	System Walkdown	V.C-1 (E-35)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Containment Leak Rate	V.C-5 (E-22)	3.2.1-35	E
Valve body	Pressure boundary	Stainless steel	Air – Indoor (int)	None	None			G
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	Gas (int)	None	None	V.F-15 (EP-22)	3.2.1-56	A
Valve body	Pressure boundary	Stainless steel	Treated water	Loss of material	Water Chemistry Control – BWR	V.C-4 (E-33)	3.2.1-3	A

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 system (Section 2.3.3.1)
- salt service water system (Section 2.3.3.2)
- reactor building closed cooling water system (Section 2.3.3.3)
- emergency diesel generator system (Section 2.3.3.4)
- station blackout diesel generator system (Section 2.3.3.5)
- security diesel (Section 2.3.3.6)
- fuel oil system (Section 2.3.3.7)
- instrument air system (Section 2.3.3.8)
- fire protection—water system (Section 2.3.3.9)
- fire protection—halon system (Section 2.3.3.10)
- heating, ventilation and air conditioning systems (Section 2.3.3.11)
- primary containment atmosphere control (Section 2.3.3.12)
- fuel pool cooling and fuel handling and storage systems (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 (SLC) System — Summary of Aging Management Evaluation

- Table 3.3.2-2 Salt Service Water (SSW) Systems — Summary of Aging Management Evaluation

- Table 3.3.2-3 Reactor Building Closed Cooling Water (RBCCW) System — Summary of Aging Management Evaluation

- Table 3.3.2-4 Emergency Diesel Generator (EDG) System — Summary of Aging Management Evaluation

- Table 3.3.2-5 Station Blackout Diesel (SBO) System — Summary of Aging Management Evaluation
- Table 3.3.2-6 Security Diesel — Summary of Aging Management Evaluation
- Table 3.3.2-7 Fuel Oil (FO) System — Summary of Aging Management Evaluation
- Table 3.3.2-8 Instrument Air (IA) System — Summary of Aging Management Evaluation
- Table 3.3.2-9 Fire Protection—Water System — Summary of Aging Management Evaluation
- Table 3.3.2-10 Fire Protection—Halon System — Summary of Aging Management Evaluation
- Table 3.3.2-11 Heating, Ventilation and Air Conditioning (HVAC) Systems — Summary of Aging Management Evaluation
- Table 3.3.2-12 Primary Containment Atmosphere Control (PCAC) Systems—Summary of Aging Management Evaluation
- Table 3.3.2-13 Fuel Pool Cooling (FPC) and Fuel Handling and Storage Systems — Summary of Aging Management Evaluation

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

- Table 3.3.2-14-1 Circulating Water System, Nonsafety-Related Components Affecting Safety-Related Systems (CWS)—Summary of Aging Management Evaluation
- Table 3.3.2-14-2 Compressed Air System, Nonsafety-Related Components Affecting Safety-Related Systems (CAS)—Summary of Aging Management Evaluation
- Table 3.3.2-14-3 Condensate System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-4 Condensate Demineralizer (CDS), Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.3.2-14-28 Residual Heat Removal (RHR) System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-29 Salt Service Water (SSW) System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-30 Sampling Systems, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-31 Sanitary Soiled Waste and Vent; Plumbing and Drains, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-32 Screen Wash System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-33 Standby Liquid Control (SLC) System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-34 Turbine Building Closed Cooling Water (TBCCW) System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14-35 Turbine Generator and Auxiliaries, 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 System

Materials

Standby liquid control system components are constructed of the following materials.

- carbon steel

- stainless steel
- carbon steel (coated)

Environment

Standby liquid control system components are exposed to the following environments.

- air – indoor
- sodium pentaborate
- concrete

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.

- System Walkdown
- Water Chemistry Control – BWR
- Periodic Surveillance and Preventive Maintenance

3.3.2.1.2 Salt Service Water System

Materials

Salt service water system components are constructed of the following materials.

- carbon steel
- copper alloy (aluminum bronze)
- copper alloy < 15% zinc
- copper alloy > 15% zinc
- nickel alloy
- stainless steel
- titanium

Environment

Salt service water systems components are exposed to the following environments.

- condensation
- soil
- raw water
- treated water

Aging Effects Requiring Management

The following aging effects associated with the salt service water systems require management.

- loss of material
- loss of material—wear

Aging Management Programs

The following aging management programs manage the effects of aging on salt service water systems components.

- System Walkdown
- Buried Piping and Tanks Inspection
- Service Water Integrity
- Water Chemistry Control – Closed Cooling Water
- Selective Leaching

3.3.2.1.3 Reactor Building Closed Cooling Water System

Materials

Reactor building closed cooling water system components are constructed of the following materials.

- carbon steel
- copper alloy < 15% zinc
- copper alloy > 15% zinc
- gray cast iron
- stainless steel

Environment

Reactor building closed cooling water system components are exposed to the following environments.

- air—indoor
- condensation
- lube oil
- raw water
- treated water
- treated water > 140°F
- treated water > 270°F

Aging Effects Requiring Management

The following aging effects associated with the reactor building closed cooling water 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 reactor building closed cooling water system components.

- Heat Exchanger Monitoring
- Oil Analysis
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- System Walkdown
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Cooling Water

3.3.2.1.4 Emergency Diesel Generator System

Materials

Emergency diesel generator system components are constructed of the following materials.

- carbon steel

- stainless steel
- copper alloy > 15% zinc
- glass
- aluminum

Environment

Emergency diesel generator system components are exposed to the following environments.

- air – indoor
- air – outdoor
- air—untreated
- exhaust gas
- lube oil (int)
- treated water

Aging Effects Requiring Management

The following aging effects associated with the emergency diesel generator 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 emergency diesel generator system components.

- System Walkdown
- Periodic Surveillance and Preventive Maintenance
- Oil Analysis
- Selective Leaching
- Water Chemistry Control – Closed Cooling Water

3.3.2.1.5 Station Blackout Diesel Generator System

Materials

Station blackout diesel generator system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy < 15% zinc
- copper alloy > 15% zinc
- glass
- gray cast iron
- stainless steel

Environment

Station blackout diesel generator system components are exposed to the following environments.

- air – indoor
- air – outdoor
- treated water > 140°F
- lube oil
- soil
- exhaust gas
- treated air

Aging Effects Requiring Management

The following aging effects associated with the station blackout diesel generator system require management.

- cracking
- cracking—-fatigue
- fouling
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on station blackout diesel generator systemcomponents.

- System Walkdown
- Water Chemistry Control – Closed Cooling Water
- Oil Analysis

- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Buried Piping and Tanks Inspection

3.3.2.1.6 Security Diesel

Materials

Security diesel components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy < 15% zinc
- copper alloy > 15% zinc
- gray cast iron

Environment

Security diesel components are exposed to the following environments.

- air – indoor
- exhaust gas
- lube oil
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with security diesel components require management.

- cracking—fatigue
- fouling
- loss of material
- loss of material—wear

Aging Management Programs

The following aging management programs manage the effects of aging on security diesel components.

- Oil Analysis
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- System Walkdown
- Water Chemistry Control – Closed Cooling Water

3.3.2.1.7 Fuel Oil System

Materials

Fuel oil system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy > 15%zinc
- fiberglass
- plastic
- stainless steel

Environment

Fuel oil system components are exposed to the following environments.

- air—indoor
- air—outdoor
- 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 effects of aging on fuel oil system components.

- Buried Piping and Tanks Inspection
- Diesel Fuel Monitoring
- System Walkdown

3.3.2.1.8 Instrument Air System

Materials

Instrument air system components are constructed of the following materials.

- carbon steel
- copper alloy < 15% zinc
- copper alloy > 15% zinc

- fluoropolymer (Teflon)
- stainless steel

Environment

Instrument air system components are exposed to the following environments.

- air—indoor
- air—treated

Aging Effects Requiring Management

The following aging effects associated with the instrument air system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on instrument air system components.

- Instrument Air Quality
- System Walkdown

3.3.2.1.9 Fire Protection—Water System

Materials

Fire protection—water system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy > 15% zinc
- copper alloy < 15% zinc
- gray cast iron
- stainless steel

Environment

Fire protection—water system components are exposed to the following environments.

- air—indoor
- air—outdoor
- exhaust gas

- lube oil
- soil
- treated water

Aging Effects Requiring Management

The following aging effects associated with the fire protection—water system require management.

- cracking
- cracking—fatigue
- fouling
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on fire protection—water system components.

- Buried Piping and Tanks Inspection
- Fire Protection
- Fire Water System
- Oil Analysis
- Selective Leaching
- System Walkdown

3.3.2.1.10 Fire Protection—Halon System

Materials

Fire protection—Halon system components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc
- stainless steel braid, Teflon liner
- stainless steel

Environment

Fire protection—Halon system components are exposed to the following environments.

- air—indoor
- Halon

Aging Effects Requiring Management

The following aging effects associated with the fire protection—Halon system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on fire protection—Halon system components.

- Fire Protection
- System Walkdown

3.3.2.1.11 Heating, Ventilation and Air Conditioning Systems

Materials

Heating, ventilation and air conditioning systems components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy < 15% zinc
- copper alloy > 15% zinc
- elastomer
- stainless steel

Environment

Heating, ventilation and air conditioning systems components are exposed to the following environments.

- air—indoor
- air—outdoor
- condensation
- treated water

Aging Effects Requiring Management

The following aging effects associated with the heating, ventilation and air conditioning systems require management.

- change in material properties
- cracking

- fouling
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on heating, ventilation and air conditioning systems components.

- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- System Walkdown
- Water Chemistry Control – Closed Cooling Water

3.3.2.1.12 Primary Containment Atmosphere Control

Materials

Primary containment atmosphere control system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Primary containment atmosphere control system components are exposed to the following environments.

- air—indoor
- gas

Aging Effects Requiring Management

The following aging effects associated with the primary containment atmosphere control system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the primary containment atmosphere control system components.

- System Walkdown

3.3.2.1.13 Fuel Pool Cooling and Fuel Handling and Storage Systems

Materials

Fuel pool cooling and fuel handling and storage system components are constructed of the following materials.

- carbon steel
- stainless steel
- boron carbide/elastomer
- aluminum/boron carbide

Environment

Fuel pool cooling and fuel handling and storage system components are exposed to the following environments.

- air—indoor
- treated water

Aging Effects Requiring Management

The following aging effects associated with the fuel pool cooling and fuel handling and storage system require management.

- change of properties
- cracking
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on fuel pool cooling and fuel handling and storage system components.

- Boraflex Monitoring
- System Walkdown
- Water Chemistry Control – BWR

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.

- carbon steel
- carbon steel with stainless steel lining
- copper alloy < 15% zinc
- copper alloy > 15% zinc
- elastomer
- glass
- gray cast iron
- nickel alloy
- plastic
- stainless steel

Environment

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- air—indoor
- air—untreated
- condensation
- fuel oil
- lube oil
- raw water
- sodium pentaborate
- steam > 220°F
- steam > 270°F
- treated water
- treated water > 140°F
- treated water > 220°F
- treated water > 270°F
- untreated water

Aging Effects Requiring Management

The following aging effects associated with nonsafety-related components affecting safety-related systems require management.

- change in material properties
- cracking
- cracking—fatigue
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on nonsafety-related components affecting safety-related systems.

- Diesel Fuel Monitoring
- Fire Water System
- Flow-Accelerated Corrosion
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- System Walkdown
- 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. Section 3.3.2.2 of NUREG-1800 discusses these aging effects and other issues that require further evaluation. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the PNPS approach to these 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 (cracking-fatigue), the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed in Section 4.3.

3.3.2.2.2 Reduction of Heat Transfer due to Fouling

Reduction of heat transfer due to fouling could occur for stainless steel heat exchanger tubes exposed to treated water. However, heat transfer is not a license renewal intended function for any of the auxiliary system heat exchangers with stainless steel tubes exposed to treated water. This item is not applicable to PNPS.

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 PNPS 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 PNPS.

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 PNPS. There are no auxiliary system components at PNPS with stainless steel cladding. For PNPS 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 in stainless steel diesel engine exhaust piping exposed to diesel exhaust is an aging effect requiring management at PNPS. At PNPS cracking of stainless steel exhaust piping in the station blackout diesel generator system is managed by the Periodic Surveillance and Preventive Maintenance Program. This program uses visual and other NDE techniques to manage cracking of the piping. These inspections will manage the aging effect of cracking such that the intended function of the component will not be affected.

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. PNPS is a BWR and does not have a stainless steel nonregenerative heat exchanger exposed to treated borated water. This item is not applicable to PNPS.

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. PNPS is a BWR and does not have a stainless steel nonregenerative heat exchanger exposed to treated borated water. This item is not applicable to PNPS.

3. Cracking due to SCC and cyclic loading could occur for the stainless steel pump casing for the PWR high-pressure pumps in the chemical and volume control system. PNPS is a BWR and does not have a chemical volume control system. This item is not applicable to PNPS.

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 duct flexible connections of the heating, ventilation and air conditioning systems exposed to air-indoor are aging effects requiring management at PNPS. These aging effects are managed by the Periodic Surveillance and Preventive Maintenance (PSPM) Program. The PSPM 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 PNPS, no credit is taken for any elastomer linings to prevent loss of material from the underlying carbon steel material such that the material is identified as carbon steel for the aging management review. This item is not applicable to PNPS.

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 the Boral coupon inspected in 2000 is consistent with the staff's conclusion and an aging management program is not required.

3.3.2.2.7 Loss of Material due to General, Pitting, and Crevice Corrosion

1. Steel piping and components in auxiliary systems at PNPS 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. Operating experience at PNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

   PNPS is a BWR with an inert containment atmosphere and as a result has no reactor coolant pump oil collection system.

2. PNPS 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 auxiliary 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 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, station blackout diesel generator, and security diesel generator systems is managed by the Periodic Surveillance and Preventive Maintenance Program. This program uses visual and other NDE techniques to manage loss of material for these components. The carbon steel diesel exhaust piping and components in the fire protection system is 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 programs 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 salt service water, fuel oil, and fire protection-water systems at PNPS 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 10 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. Fouling is not an aging effect requiring management for the fuel oil system at PNPS. 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 PNPS 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 inspections of storage tank bottoms where water and contaminants accumulate will be performed to confirm the effectiveness of the Diesel Fuel Monitoring Program. In addition, operating experience at PNPS has confirmed the effectiveness of this program in maintaining fuel oil quality within limits such that loss of material will not affect the intended functions of these components.

2. Loss of material due to general, pitting, crevice, MIC and fouling for carbon steel heat exchanger components exposed to lubricating oil is an aging effect requiring management in the auxiliary systems at PNPS, 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 or fouling. Operating experience at PNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion and fouling has not and will not affect the intended functions of these components.

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 BWR and PWR steel piping with elastomer lining or stainless steel cladding that are exposed to treated water and treated borated water if the cladding or lining is degraded. For the auxiliary systems at PNPS no credit is taken for any elastomer linings or stainless steel cladding to prevent loss of material from the underlying carbon steel material such that the material is identified as carbon steel for the aging management review. This item is not applicable to PNPS.

2. In the auxiliary systems at PNPS 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 PNPS 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 auxiliary systems is managed by the System Walkdown and Periodic Surveillance and Preventive Maintenance (PSPM) Programs. These programs include a periodic visual

inspection and the PSPM Program includes 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 PNPS 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. Operating experience at PNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

5. Loss of material due to pitting and crevice corrosion could occur for HVAC aluminum piping, piping components, and piping elements and stainless steel ducting and components exposed to condensation. At PNPS there are no aluminum components or stainless steel ducting exposed to condensation in the HVAC systems. However, this item can be applied to stainless steel components exposed to condensation, both internal and external, in other systems. The System Walkdown Program will manage loss of material in stainless steel components exposed externally to condensation. The Periodic Surveillance and Preventive Maintenance Program will manage loss of material in stainless steel components exposed internally 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 PNPS 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 in copper alloy components exposed internally to untreated air, which is equivalent to condensation, through the use of visual inspections or other NDE techniques.

   The Instrument Air Quality Program will manage loss of material in copper alloy components exposed internally to treated air. The instrument air quality maintains humidity and particulates within acceptable limits, thereby preserving the environment of treated air that is not conducive to corrosion. This is equivalent to the management of loss of material in steel and stainless steel components addressed in Item Numbers 3.3.1-53 and 54 respectively.

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 PNPS there are no stainless steel components exposed to soil in the Auxiliary systems. This item is not applicable to PNPS Auxiliary systems.

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 PNPS 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 could occur for copper alloy piping and components exposed to treated water. At PNPS there are no copper alloy components exposed to treated water in the auxiliary systems. However, this item can be applied to copper alloy components exposed to treated water in the high pressure coolant injection and reactor core isolation cooling systems. The Water Chemistry Control – BWR Program will manage loss of material for these components. 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. In the auxiliary systems at PNPS there are no aluminum components exposed to fuel oil. 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 PNPS 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. Operating experience at PNPS has confirmed the effectiveness of this program in maintaining fuel oil quality within limits such that loss of material will not affect the intended functions of these stainless steel and copper alloy 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. Operating experience at PNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

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 PNPS, in the auxiliary systems, this specific aging effect for elastomers is not applicable based on operating experience. 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 PNPS 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. PNPS is a BWR and has no charging pumps. This item is not applicable to PNPS.

3.3.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of PNPS quality assurance procedures and administrative controls for aging management programs.

3.3.2.3 Time-Limited Aging Analysis

The only TLAA identified for auxiliary system 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 the following tables and Section 3.3.2.1. A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging associated with the auxiliary 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 (Continued)

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. Heat transfer is not a license renewal intended function for any of the auxiliary system heat exchangers with stainless steel tubes exposed to treated water. 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.
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 of 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 3.3.2.2.3 item 2.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Cracking of stainless steel diesel exhaust components will be managed by the Periodic Surveillance and Preventive Maintenance Program. 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				
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.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. There are no elastomer lined components exposed to treated water in the auxiliary systems. See Section 3.3.2.2.5 item 2.
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.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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. PNPS operates with an inerted containment. See Section 3.3.2.2.7 item 1.
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. PNPS operates with an inerted containment. See Section 3.3.2.2.7 item 1.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 (Continued)					
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 (Continued)

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. Lined or clad steel components have no intended functions in the fuel pool cooling system. 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. See Section 3.3.2.2.10 item 2.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
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 with intended functions 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 System Walkdown and Periodic Surveillance and Preventive Maintenance 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 (Continued)					
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 System Walkdown and Periodic Surveillance and Preventive Maintenance Programs will manage loss of material in stainless steel components. There are no aluminum components exposed to condensation in the auxiliary systems. 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, one-time inspection and Instrument Air Quality Programs will manage loss of material 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 stainless steel components exposed to soil in the auxiliary systems. See Section 3.3.2.2.10 item 7.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
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 only components to which this NUREG-1801 line item applies are in the high pressure coolant injection and reactor core isolation cooling systems in Tables 3.2.2-4 and 3.2.2-5. See Section 3.3.2.2.11.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
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 with intended functions 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 wear as an applicable aging effect. See Section 3.3.2.2.13.
3.3.1-35	PWR only				
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	Consistent with NUREG-1801. The degradation of boraflex is managed by the Boraflex Monitoring Program.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
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. Supplement 1 to GL 88-01 states that IGSCC inspection of RWCU piping outside of the containment isolation valves is recommended only until actions associated with GL 89-10 on motor operated valves are completed. Since PNPS has satisfactorily completed all actions requested in NRC GL 89-10, the Water Chemistry Control - BWR Program is used in lieu of the BWR Reactor Water Cleanup System Program to manage this potential aging effect.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-37 continued					This aging management program is appropriate for the aging effect identified and provides assurance that the aging effect will be effectively managed through the period of extended operation.
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.
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 >60°C (> 140°F).

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	The System Walkdown Program manages loss of material in steel tanks of the diesel fuel oil system exposed to air - outdoor (external).
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 line Items 3.3.1-43, 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	The System Walkdown Program manages the loss of material for steel bolting through the use of visual inspections that are performed at least once per refueling cycle.
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	This line item was not used. Loss of material of steel closure bolting was addressed by other items including line Items 3.3.1-43, 3.3.1-55 and 3.3.1-58.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
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 PNPS is standard grade B7 carbon steel, or similar material, except in rare specialized applications such as applications 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 PNPS 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.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-45 continued					To address these bolting operational concerns, PNPS 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 PNPS.
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	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages cracking for stainless steel components exposed to closed cycle cooling water > 60°C (> 140°F).

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
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	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for steel components exposed to closed cycle cooling water.
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	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for steel heat exchanger components exposed to closed cycle cooling water.
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	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for stainless steel heat exchanger components exposed to closed cycle cooling water.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for stainless steel components exposed to closed cycle cooling water.
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	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for copper alloy components exposed to closed cycle cooling water.
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	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages reduction of heat transfer for steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	The Instrument Air Quality Program manages loss of material for carbon steel components exposed to treated air. The One-Time Inspection Program manages loss of material for steel components exposed to untreated air. The components to which this program applies are listed in series 3.3.2-14-xx tables for components included in scope only under criterion 10 CFR 54.4(a)(2).
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	The Instrument Air Quality Program manages loss of material for stainless steel components exposed to treated air. The One-Time Inspection Program manages loss of material for stainless steel components exposed to untreated air. The components to which this program applies are listed in series 3.3.2-14-xx tables for components included in scope only under criterion 10 CFR 54.4(a)(2).

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 System Walkdown Program manages loss of material for steel ducting closure bolting.
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 System Walkdown Program manages loss of material for external surfaces of steel components.
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 System Walkdown 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. The System Walkdown Program manages loss of material for external surfaces of steel components.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 System Walkdown Program manages loss of material for external surfaces of steel heat exchanger components. The Periodic Surveillance and Preventive Maintenance Program manages loss of material for external surfaces of steel heat exchanger components of the security diesel.
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 System Walkdown 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	Not applicable. There are no aluminum components with intended functions exposed to raw water in the auxiliary systems.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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	This line item was not used. Loss of material of steel components exposed to fuel oil was addressed by other items including line Items 3.3.1-20 and 3.3.1-32
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.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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	The loss of material in steel components exposed to raw or untreated water is managed by the Periodic Surveillance and Preventive Maintenance 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.
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	This line item was not used. The Fire Protection system uses city water which is considered to be treated water rather than raw water.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	This line item was not used. The Fire Protection system uses city water which is considered to be treated water rather than raw water.
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 loss of material for steel components exposed to moist air or condensation is managed by the Periodic Surveillance and Preventive Maintenance Program 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	Loss of material of steel component internal surfaces exposed to condensation is managed by the System Walkdown Program. The System Walkdown 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 surfaces condition will be representative of internal surfaces. Thus, loss of material on internal carbon steel surfaces is also managed by the System Walkdown Program.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	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.
3.3.1-74	Steel cranes - rails exposed to air – indoor 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	The degradation of elastomer components exposed to raw or untreated water is managed by the Periodic Surveillance and Preventive Maintenance Program. The only components to which this NUREG-1801 line item applies are components included in scope only under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-14-xx tables.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 components of the salt service water system. The Service Water Integrity Program manages loss of material in steel components exposed to raw water. The Periodic Surveillance and Preventive Maintenance Program manages loss of material of steel components exposed to raw water in the screen wash system.
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	Not applicable. Steel heat exchanger components are not exposed to raw water in the auxiliary systems.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 components of the salt service water system. The Service Water Integrity Program manages loss of material in nickel alloy components exposed to raw water. Stainless steel and copper alloy components exposed to raw water are addressed in other items including line items 3.3.1-79 and 3.3.1-81. The Periodic Surveillance and Preventive Maintenance Program manages loss of material of nickel alloy components exposed to raw water in the screen wash system.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 components of the salt service water system. The Service Water Integrity Program manages loss of material in stainless steel components exposed to raw water. The One-Time Inspection and Periodic Surveillance and Preventive Maintenance Programs manage loss of material of stainless steel components exposed to raw or untreated water in other systems.
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	Not applicable. This line applies to EDG system components. At PNPS, these components are not exposed to raw water.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 components of the salt service water system. The Service Water Integrity Program manages loss of material in copper alloy components exposed to raw water. The Periodic Surveillance and Preventive Maintenance Program manages loss of material of copper alloy components exposed to raw water in other systems.
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 exposed to raw water.
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	Consistent with NUREG-1801. The Service Water Integrity Program manages reduction of heat transfer in copper alloy heat exchanger tubes exposed to raw water.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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% Zn components exposed to all types of water.
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 structural components in Section 3.5.
3.3.1-87	PWR only				
3.3.1-88	PWR only				

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-89	PWR only				
3.3.1-90	PWR only				
3.3.1-91	PWR only				
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, piping components, and 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.

Table 3.3.1 Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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.
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	Consistent with NUREG-1801.
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 (Continued)					
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	Not applicable. Dried (treated) air is maintained as an environment as a result of the Instrument Air Quality Program, so aging effects may occur without that program.
3.3.1-99	PWR only				

Notes for Table 3.3.2-1 through 3.3.2-14-35

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 coating on the interior of the steel tank is a phenolic resin.

302. This treated water environment is the equivalent of the NUREG-1801 defined closed cycle cooling water.

303. The untreated air environment is the equivalent of the NUREG-1801 defined condensation.

304. This treated air environment is dried and filtered air but is not monitored by the Instrument Air Quality Program and thus is subject to condensation.

305. The treated water in the SBO diesel generator sight glass may be greater than 140°F but is not significantly higher and will not lead to degradation of the glass.
306. The fire water is treated water since it is provided by the municipal water system. The quality of the water is regulated by the Massachusetts Department of Environmental Protection under code 310 CMR 22, but is not monitored further at PNPS.
307. This treated water environment is the fire diesel engine jacket cooling water.
308. This treated water environment does not directly match any NUREG-1801 defined environment. However, for the purposes of evaluating selective leaching, comparison to NUREG-1801 treated water is acceptable since selective leaching is applicable to all water types.
309. This treated water environment is controlled by the Water Chemistry Control – Auxiliary Systems Program, but is not directly comparable to any NUREG-1801 defined environment.

Table 3.3.2-1
Standby Liquid Control System (SLC)
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**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Heater housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Heater housing	Pressure boundary	Stainless steel	Sodium pentaborate (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
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 (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
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 (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A

Table 3.3.2-1: Standby Liquid Control System (Continued)								
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 (coated)	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel (coated)	Sodium pentaborate (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			F, 301
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	Concrete (ext)	None	None	VII.J-17 (AP-19)	3.3.1-96	A
Tank	Pressure boundary	Stainless steel	Sodium pentaborate (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
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 (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	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	Sodium pentaborate (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A

Table 3.3.2-1: Standby Liquid Control System (Continued)								
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	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Sodium pentaborate (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A

Table 3.3.2-2
Salt Service Water System (SSW)
Summary of Aging Management Evaluation

Table 3.3.2-2: Salt 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	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
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	Nickel alloy	Condensation (ext)	Loss of material	System Walkdown			F
Bolting	Pressure boundary	Nickel alloy	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-13 (AP-53)	3.3.1-78	D
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Heat exchanger (shell)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
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)	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-3 (A-65)	3.3.1-82	B
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-4 (AP-12)	3.3.1-51	D

Table 3.3.2-2: Salt Service Water System (Continued)								
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 – wear	Service Water Integrity			H
Orifice	Pressure boundary and flow control	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Orifice	Pressure boundary and 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	System Walkdown	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	B
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.C1-18 (A-01)	3.3.1-19	B
Piping	Pressure boundary	Titanium	Condensation (ext)	None	None			F
Piping	Pressure boundary	Titanium	Raw water (int)	Loss of material	Service Water Integrity			F
Piping	Pressure boundary	Titanium	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection			F

Table 3.3.2-2: Salt Service Water System (Continued)								
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	Copper alloy (aluminum bronze)	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	B
Pump casing	Pressure boundary	Copper alloy (aluminum bronze)	Raw water (int)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	A
Pump casing	Pressure boundary	Copper alloy (aluminum bronze)	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	B
Pump casing	Pressure boundary	Copper alloy (aluminum bronze)	Raw water (ext)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	A
Thermowell	Pressure boundary	Titanium	Condensation (ext)	None	None			F
Thermowell	Pressure boundary	Titanium	Raw water (int)	Loss of material	Service Water Integrity			F
Tubing	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Tubing	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
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E

Table 3.3.2-2: Salt Service Water System (Continued)								
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	System Walkdown	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	Carbon steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Valve body	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
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	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
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	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	Nickel alloy	Condensation (ext)	Loss of material	System Walkdown			F
Valve body	Pressure boundary	Nickel alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-13 (AP-53)	3.3.1-78	B

Table 3.3.2-3
Reactor Building Closed Cooling Water System (RBCCW)
Summary of Aging Management Evaluation

Table 3.3.2-3: Reactor Building Closed 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
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	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Heat exchanger (bonnets)	Pressure boundary	Carbon steel	Treated water	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	B
Heat exchanger (bonnets)	Pressure boundary	Gray cast iron	Treated water	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	B
Heat exchanger (bonnets)	Pressure boundary	Gray cast iron	Treated water	Loss of material	Selective Leaching	VII.C2-8 (A-50)	3.3.1-85	C
Heat exchanger (bonnets)	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Heat exchanger (bonnets)	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

Table 3.3.2-3: Reactor Building Closed Cooling Water System (Continued)								
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)	Structural support for Criterion (a)(1) equipment	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Heat exchanger (housing)	Structural support for Criterion (a)(1) equipment	Carbon steel	Condensation (int)	Loss of material	System Walkdown	VII.F2-3 (A-08)	3.3.1-72	E
Heat exchanger (housing)	Structural support for Criterion (a)(1) equipment	Carbon steel	Air-indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heat exchanger (housing)	Structural support for Criterion (a)(1) equipment	Carbon steel	Air-indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	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	B
Heat exchanger (shell)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A

Table 3.3.2-3: Reactor Building Closed Cooling Water System (Continued)								
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
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	D
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air-indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Lube oil	Loss of material	Oil Analysis	VII.C2-12 (AP-59)	3.3.1-33	E
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)	Pressure boundary	Copper alloy < 15% Zn	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-4 (AP-12)	3.3.1-51	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-3 (AP-65)	3.3.1-82	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Treated water (ext)	Loss of material - wear	Service Water Integrity			H

Table 3.3.2-3: Reactor Building Closed Cooling Water System (Continued)								
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	Treated water (ext)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.C2-2 (AP-80)	3.3.1-52	B
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-4 (AP-12)	3.3.1-51	D
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 (ext)	Loss of material – wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material	Oil Analysis	VII.C2-5 (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	Air-indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
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	Condensation (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1-16 (A-46)	3.3.1-25	E

Table 3.3.2-3: Reactor Building Closed Cooling Water System (Continued)

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 (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
Heat exchanger (tubes)	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
Heat exchanger (tubes)	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	D
Heat exchanger (tubes)	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 (tubes)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-2 (A-70)	3.3.1-23	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-14 (A-71)	3.3.1-5	E
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
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

Table 3.3.2-3: Reactor Building Closed Cooling Water System (Continued)

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	Carbon steel	Air-indoor (ext)	Loss of material	System Walkdown	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
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air-indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	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	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Piping	Pressure boundary	Stainless steel	Air-indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	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	B
Pump casing	Pressure boundary	Carbon steel	Air-indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-3: Reactor Building Closed Cooling Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sample chamber	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
Sample chamber	Pressure boundary	Stainless steel	Air-indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	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
Strainer housing	Pressure boundary	Carbon steel	Air-indoor (ext)	Loss of material	System Walkdown	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
Tank	Pressure boundary	Carbon steel	Air-indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	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
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Thermowell	Pressure boundary	Stainless steel	Air-indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-3: Reactor Building Closed Cooling Water System (Continued)								
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 – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	B
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Tubing	Pressure boundary	Stainless steel	Air-indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	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	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air-indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-4
Emergency Diesel Generator System (EDG)
Summary of Aging Management Evaluation

Table 3.3.2-4: 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**
Air motor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Air 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, 303
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Expansion joint (exhaust flex joint)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Expansion joint (exhaust flex joint)	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking-fatigue	TLAA-metal fatigue			H
Expansion joint (exhaust flex joint)	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
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
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	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Fogger housing	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Fogger housing	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, 303
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.H2-4 (AP-40)	3.3.1-59	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	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.H2-23 (A-25)	3.3.1-47	D
Heat exchanger (bonnet)	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	D
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air-indoor (ext)	Loss of material	System Walkdown	VII.H2-3 (AP-41)	3.3.1-59	A

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
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)	Heat transfer	Copper alloy > 15% Zn	Air – indoor (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Air – outdoor (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			H
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	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.H2-12 (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 – Closed Cooling Water	VII.H2-8 (AP-12)	3.3.1-51	D
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 3.3.2-4: Emergency Diesel Generator System (Continued)								
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)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Air – outdoor (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance			G
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Air – outdoor (ext)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance			H
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heater housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Heater housing	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
Orifice	Pressure boundary & flow control	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary & flow control	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
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	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
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, 303
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	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Air—untreated (int)	Cracking-fatigue	TLAA-metal fatigue			H
Piping	Pressure boundary	Stainless steel	Air—untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1-1 (A-09)	3.3.1-27	E, 303
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
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	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 – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Rack booster housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Rack booster 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, 303
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
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	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 – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Silencer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking-fatigue	TLAA-metal fatigue			H

Table 3.3.2-4: Emergency Diesel Generator System (Continued)

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)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	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.H2-20 (AP-30)	3.3.1-14	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
Tanks	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tanks	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
Tanks	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, 303

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
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	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
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	System Walkdown	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	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	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
Turbocharger housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Turbocharger housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Turbocharger housing	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking-fatigue	TLAA-metal fatigue			H

Table 3.3.2-4: Emergency Diesel Generator System (Continued)

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	VII.J-1 (AP-36)	3.3.1-95	A
Valve body	Pressure boundary	Aluminum	Air – indoor (int)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E
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	Carbon steel	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	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	VII.H2-10 (AP-47)	3.3.1-26	E
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	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	A, 302

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
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	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-17 (AP-59)	3.3.1-33	E
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis			H
Valve body	Pressure boundary	Stainless steel	Air—untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1-1 (A-09)	3.3.1-27	E, 303

Table 3.3.2-5
Station Blackout Diesel Generator System (SBO)
Summary of Aging Management Evaluation

Table 3.3.2-5: Station Blackout 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-1 (AP-28)	3.3.1-43	E
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	Air – outdoor (ext)	Loss of material	System Walkdown			G
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
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	Carbon steel	Treated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E

Table 3.3.2-5: Station Blackout Diesel Generator System (Continued)								
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	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	D
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E
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)	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 > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-8 (AP-12)	3.3.1-51	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	C, 302
Heat exchanger (tubes)	Pressure boundary	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2-5 (AP-39)	3.3.1-21	E

Table 3.3.2-5: Station Blackout Diesel Generator System (Continued)								
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	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	D
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water > 140°F (int)	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			H
Heat exchanger (tubes)	Heat transfer	Carbon steel	Lube oil (ext)	Fouling	Oil Analysis	VIII.G-15 (SP-63)	3.4.1-10	D
Heat exchanger (tubes)	Heat transfer	Carbon steel	Treated water > 140°F (int)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.F1-13 (AP-77)	3.3.1-52	D
Heat exchanger (fins)	Heat transfer	Aluminum	Air – indoor	Fouling	Periodic Surveillance and Preventive Maintenance			H
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heater housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E

Table 3.3.2-5: Station Blackout Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heater housing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	D
Lubricator housing	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Lubricator housing	Pressure boundary	Copper alloy > 15% Zn	Treated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304
Motor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Motor housing	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304

Table 3.3.2-5: Station Blackout Diesel Generator System (Continued)								
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	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	D
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
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	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
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	Exhaust gas (int)	Cracking-fatigue	Periodic Surveillance and Preventive Maintenance			H

Table 3.3.2-5: Station Blackout Diesel Generator System (Continued)								
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	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Piping	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.H2-1 (AP-33)	3.3.1-6	E
Piping	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking-fatigue	Periodic Surveillance and Preventive Maintenance			H
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	D

Table 3.3.2-5: Station Blackout Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Radiator box header	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	D
Radiator box header	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Radiator tubes	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	D
Radiator tubes	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	D
Radiator tubes	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance			G
Radiator tubes	Heat transfer	Stainless steel	Treated water > 140°F (int)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.C2-3 (AP-63)	3.3.1-52	D
Radiator tubes	Heat transfer	Aluminum (fins)	Air-outdoor (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			G
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A

Table 3.3.2-5: Station Blackout Diesel Generator System (Continued)								
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 > 140°F (int)	None	None	VII.J-13 (AP-51)	3.3.1-93	A, 305
Silencer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
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
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking – fatigue	Periodic Surveillance and Preventive Maintenance			H
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	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.H2-20 (AP-30)	3.3.1-14	E
Strainer housing	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304
Strainer	Filtration	Stainless steel	Lube oil (int)	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

Table 3.3.2-5: Station Blackout Diesel Generator System (Continued)								
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 air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304
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	Treated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	D
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)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Closed Cooling Water	VII.C2-11 (AP-60)	3.3.1-46	D

Table 3.3.2-5: Station Blackout Diesel Generator System (Continued)								
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	Copper alloy > 15% Zn	Air indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Thermowell	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-8 (AP-12)	3.3.1-51	D
Thermowell	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	C, 302
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)	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 – Closed Cooling Water	VII.C2-11 (AP-60)	3.3.1-46	D
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-17 (AP-59)	3.3.1-33	E
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis			H
Tubing	Pressure boundary	Stainless steel	Treated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304

Table 3.3.2-5: Station Blackout Diesel Generator System (Continued)								
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 < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-8 (AP-12)	3.3.1-51	D
Tubing	Pressure boundary	Copper alloy < 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tubing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	D
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	Carbon steel	Treated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304
Turbocharger	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-5: Station Blackout Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Turbocharger	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E
Turbocharger	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
Turbocharger	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking – fatigue	Periodic Surveillance and Preventive Maintenance			H
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 air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304
Valve body	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

Table 3.3.2-5: Station Blackout Diesel Generator System (Continued)

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 air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-8 (AP-12)	3.3.1-51	D
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	C, 302
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
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	D
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	Carbon steel	Treated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance			H, 304

Table 3.3.2-6
Security Diesel Generator System (SD)
Summary of Aging Management Evaluation

Table 3.3.2-6: Security 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Filter housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E
Heat exchanger (radiator)	Heat transfer	Copper alloy > 15% Zn	Air - indoor (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (radiator)	Heat transfer	Copper alloy > 15% Zn	Treated water > 140°F (int)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.C2-2 (AP-80)	3.3.1-52	D
Heat exchanger (radiator)	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (radiator)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.E1-2 (AP-34)	3.3.1-51	D

Table 3.3.2-6: Security Diesel Generator System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (radiator)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	C, 302
Heat exchanger (shell)	Pressure boundary	Aluminum	Air - indoor (ext)	None	None	VII.J-1 (AP-36)	3.3.1-95	A
Heat exchanger (shell)	Pressure boundary	Aluminum	Air - indoor (int)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-5 (AP-39)	3.3.1-21	E
Heat exchanger (tubes)	Heat transfer	Carbon steel	Air - indoor (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			G
Heat exchanger (tubes)	Heat transfer	Carbon steel	Lube oil (ext)	Fouling	Oil Analysis	VIII.G-15 (SP-63)	3.4.1-10	E
Heat exchanger (tubes)	Heat transfer	Carbon steel	Treated water > 140°F (int)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.F1-13 (AP-77)	3.3.1-52	D
Heat exchanger (tubes)	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-3 (AP-41)	3.3.1-59	E

Table 3.3.2-6: Security Diesel Generator System (Continued)								
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	Carbon steel	Air - indoor (ext)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (tubes)	Pressure boundary	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2-5 (AP-39)	3.3.1-21	E
Heat exchanger (tubes)	Pressure boundary	Carbon steel	Lube oil (ext)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (tubes)	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	D
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	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 3.3.2-6: Security Diesel Generator System (Continued)								
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	VII.H2-20 (AP-30)	3.3.1-14	E
Piping	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	D
Pump casing	Pressure boundary	Gray cast iron	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Gray cast iron	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	D
Pump casing	Pressure boundary	Gray cast iron	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.C2-8 (A-50)	3.3.1-85	C, 302
Silencer	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
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

Table 3.3.2-6: Security Diesel Generator System (Continued)								
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 < 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Turbocharger	Pressure boundary	Gray cast iron	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Turbocharger	Pressure boundary	Gray cast iron	Air - indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E
Turbocharger	Pressure boundary	Gray cast iron	Exhaust gas (int)	Cracking-fatigue	Periodic Surveillance and Preventive Maintenance			H
Turbocharger	Pressure boundary	Gray cast iron	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E

Table 3.3.2-7
Fuel Oil System (FO)
Summary of Aging Management Evaluation

Table 3.3.2-7: 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-1 (AP-28)	3.3.1-43	E
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	Air - outdoor (ext)	None	None			G
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Filter housing	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Filter housing	Pressure boundary	Copper alloy > 15% Zn	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-3 (AP-44)	3.3.1-32	E
Filter housing	Pressure boundary	Plastic	Air – indoor (ext)	None	None			F

Table 3.3.2-7: Fuel Oil System (Continued)								
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	Plastic	Fuel oil (int)	None	None			F
Flame arrestor	Flow control	Aluminum	Air - outdoor (ext)	None	None			G
Flame arrestor	Flow control	Aluminum	Air - outdoor (int)	None	None			G
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heater housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Injector housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.H1-8 (A-24)	3.3.1-60	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	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.H1-9 (A-01)	3.3.1-19	B

Table 3.3.2-7: Fuel Oil System (Continued)								
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Strainer	Filtration	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-6 (AP-54)	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	System Walkdown	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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.H1-11 (A-95)	3.3.1-40	E
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
Tank	Pressure boundary	Fiberglass	Fuel oil (int)	None	None			F

Table 3.3.2-7: Fuel Oil System (Continued)								
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	Fiberglass	Soil (ext)	None	None			F
Thermowell	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Thermowell	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-3 (AP-44)	3.3.1-32	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	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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.H1-8 (A-24)	3.3.1-60	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

Table 3.3.2-8
Instrument Air System (IA)
Summary of Aging Management Evaluation

Table 3.3.2-8: Instrument 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Bolting	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Flex Hose	Pressure boundary	Stainless Steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Flex Hose	Pressure boundary	Fluoropolymer (Teflon)	Treated air (int)	None	None			F
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Tank	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-2 (A-26)	3.3.1-53	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Piping	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-2 (A-26)	3.3.1-53	E

Table 3.3.2-8: Instrument Air System (Continued)								
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	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-4 (AP-81)	3.3.1-54	E
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	Treated air (int)	Loss of material	Instrument Air Quality	VII.G-9 (AP-78)	3.3.1-28	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	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-4 (AP-81)	3.3.1-54	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated air (int)	Loss of material	Instrument Air Quality	VII.G-9 (AP-78)	3.3.1-28	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Valve body	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-2 (A-26)	3.3.1-53	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-8: Instrument Air System (Continued)								
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 air (int)	Loss of material	Instrument Air Quality	VII.D-4 (AP-81)	3.3.1-54	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	Treated air (int)	Loss of material	Instrument Air Quality	VII.G-9 (AP-78)	3.3.1-28	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	Treated air (int)	Loss of material	Instrument Air Quality	VII.G-9 (AP-78)	3.3.1-28	E

Table 3.3.2-9
Fire Protection—Water System
Summary of Aging Management Evaluation

Table 3.3.2-9: 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-1 (AP-28)	3.3.1-43	E
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	C
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	System Walkdown			G
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	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.D2-16 (E-29)	3.2.1-32	E
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.G-5 (AP-41)	3.3.1-59	A
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-5 (AP-39)	3.3.1-21	E

Table 3.3.2-9: Fire Protection - Water System (Continued)								
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	System Walkdown	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			G, 306
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.G-16 (AP-31)	3.3.1-85	C, 308
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
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water (int)	Fouling	Fire Protection			G, 306
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water (ext)	Fouling	Fire Protection			G, 306
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	Treated water (ext)	Loss of material	Fire Protection			G, 306
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (ext)	Loss of material	Selective Leaching	VII.E1-3 (AP-65)	3.3.1-84	C, 308
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Fire Protection			G, 306
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.E1-3 (AP-65)	3.3.1-84	C, 308

Table 3.3.2-9: Fire Protection - Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Hydrant	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Hydrant	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Water System			G, 306
Hydrant	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.G-16 (AP-31)	3.3.1-85	A, 308
Nozzle	Pressure boundary & flow control	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Nozzle	Pressure boundary & flow control	Carbon steel	Treated water (int)	Loss of material	Fire Water System			G, 306
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	Treated water (int)	Loss of material	Fire Water System			G, 306
Nozzle	Pressure boundary & flow control	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.A4-9 (AP-32)	3.3.1-84	C, 308
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: Fire Protection - Water System (Continued)

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	Fire Water System			G, 306
Piping	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J-1 (AP-36)	3.3.1-95	A
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	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	Treated water (int)	Loss of material	Fire Water System			G, 306
Piping	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E

Table 3.3.2-9: Fire Protection - Water System (Continued)								
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	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, 308
Piping	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Water System			G, 306
Piping	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Protection			G, 307
Piping	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.G-16 (AP-31)	3.3.1-85	A, 308
Pump casing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Gray cast iron	Lube oil (int and ext)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Water System			G, 306
Pump casing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Protection			G, 307
Pump casing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.G-16 (AP-31)	3.3.1-85	A, 308
Silencer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-9: Fire Protection - Water System (Continued)								
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	Fire Protection			H
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Fire Protection	VII.H2-2 (A-27)	3.3.1-18	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.G-18 (AP-59)	3.3.1-33	E
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Fire Water System			G, 306
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Fire Water System			G, 306
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.G-11 (AP-47)	3.3.1-26	E
Strainer housing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Water System			G, 306
Strainer housing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.G-16 (AP-31)	3.3.1-85	A, 308

Table 3.3.2-9: Fire Protection - Water System (Continued)								
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 – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Fire Water System			G, 306
Tank	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Water System			G, 306
Tank	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Protection			G, 307
Tank	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.G-16 (AP-31)	3.3.1-85	A, 308
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Fire Water System			G, 306
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	Fire Water System			G, 306
Turbocharger	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-9: Fire Protection - Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Turbocharger	Pressure boundary	Gray cast iron	Air – indoor (int)	Loss of material	Fire Protection	V.D2-16 (E-29)	3.2.1-32	E
Turbocharger	Pressure boundary	Gray cast iron	Exhaust gas (int)	Cracking – fatigue	Fire Protection			H
Turbocharger	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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Fire Water System			G, 306
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	VII.G-11 (AP-47)	3.3.1-26	E
Valve body	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Fire Water System			G, 306
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	Fire Water System			G, 306
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, 308

Table 3.3.2-9: Fire Protection - Water System (Continued)								
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	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	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, 308
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Water System			G, 306
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.G-16 (AP-31)	3.3.1-85	A, 308

Table 3.3.2-10
Fire Protection—Halon System
Summary of Aging Management Evaluation

Table 3.3.2-10: Fire Protection - Halon 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Flex hose	Pressure boundary	SS braid, Teflon liner	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Flex hose	Pressure boundary	SS braid, Teflon liner	Air – indoor (int)	None	None			F
Flex hose	Pressure boundary	SS braid, Teflon liner	Halon (int)	None	None			F
Nozzle	Pressure boundary and flow control	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Nozzle	Pressure boundary and flow control	Stainless steel	Air – indoor (int)	None	None			G
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-10: Fire Protection - Halon System (Continued)								
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.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Halon (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	B
Tank	Pressure boundary	Carbon steel	Halon (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	Halon (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	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	Halon (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None			G

Table 3.3.2-11
Heating, Ventilation and Air Conditioning Systems (HVAC)
Summary of Aging Management Evaluation

Table 3.3.2-11: 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	System Walkdown	VII.F1-4 VII.F2-4 (A-105)	3.3.1-55	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	System Walkdown	VII.F1-2 VII.F2-2 VII.F4-1 (A-10)	3.3.1-56	A
Damper housing	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
Damper housing	Pressure boundary	Aluminum	Air - indoor (ext)	None	None	VII.J-1 (AP-36)	3.3.1-95	A
Damper housing	Pressure boundary	Aluminum	Air - indoor (int)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Damper housing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Damper housing	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G

Table 3.3.2-11: Heating, Ventilation and Air Conditioning Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Duct	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.F1-2 VII.F2-2 VII.F4-1 (A-10)	3.3.1-56	A
Duct	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	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
Duct flexible connection	Pressure boundary	Elastomer	Air - indoor (ext)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.F1-7 VII.F2-7 VII.F4-6 (A-17)	3.3.1-11	E
Duct flexible connection	Pressure boundary	Elastomer	Air - indoor (ext)	Change in material properties	Periodic Surveillance and Preventive Maintenance	VII.F1-7 VII.F2-7 VII.F4-6 (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 VII.F2-7 VII.F4-6 (A-17)	3.3.1-11	E

Table 3.3.2-11: Heating, Ventilation and Air Conditioning Systems (Continued)

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 (int)	Change in material properties	Periodic Surveillance and Preventive Maintenance	VII.F1-7 VII.F2-7 VII.F4-6 (A-17)	3.3.1-11	E
Fan housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.F1-2 VII.F2-2 VII.F4-1 (A-10)	3.3.1-56	A
Fan housing	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
Filter housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.F1-2 (A-10)	3.3.1-56	A
Filter housing	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
Heat exchanger housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.F2-2 (A-10)	3.3.1-56	A
Heat exchanger housing	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F2-13 (AP-12)	3.3.1-51	D

Table 3.3.2-11: Heating, Ventilation and Air Conditioning Systems (Continued)								
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 (int)	Loss of material	Selective Leaching	VII.F2-15 (AP-43)	3.3.1-84	A, 302
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Condensation (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water (int)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.F2-10 (AP-80)	3.3.1-52	B
Louver housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.F4-1 (A-10)	3.3.1-56	C
Louver housing	Pressure boundary	Carbon steel	Air- outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Louver housing	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	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	Air - indoor (int)	None	None			G
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air - indoor (int)	None	None			G

Table 3.3.2-11: Heating, Ventilation and Air Conditioning Systems (Continued)								
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	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

Table 3.3.2-12
Primary Containment Atmosphere Control System (PCAC)
Summary of Aging Management Evaluation

Table 3.3.2-12: Primary Containment Atmosphere Control								
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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (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	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
Condensing pot	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Condensing pot	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G

Table 3.3.2-12: Primary Containment Atmosphere Control (Continued)

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	Air - indoor (int)	None	None			G
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (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

Table 3.3.2-13
Fuel Pool Cooling (FPC) and Fuel Handling and Storage Systems
Summary of Aging Management Evaluation

Table 3.3.2-13: Fuel Pool Cooling and Fuel Handling and Storage 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Neutron absorber (Boraflex)	Neutron absorption	Boron carbide/ elastomer	Treated water	Loss of material	Boraflex Monitoring	VII.A2-2 (A-87)	3.3.1-36	A
Neutron absorber (Boraflex)	Neutron absorption	Boron carbide/ elastomer	Treated water	Change in material properties	Boraflex Monitoring	VII.A2-2 (A-87)	3.3.1-36	A
Neutron absorber (Boraflex)	Neutron absorption	Boron carbide/ elastomer	Treated water	Cracking	Boraflex Monitoring	VII.A2-2 (A-87)	3.3.1-36	A
Neutron absorber (Boral)	Neutron absorption	Aluminum/ boron carbide	Treated water	Loss of material	Water Chemistry Control – BWR	VII.A2-3 (A-89)	3.3.1-13	E
Neutron absorber (Boral)	Neutron absorption	Aluminum/ boron carbide	Treated water	Cracking	Water Chemistry Control – BWR			H
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-13: Fuel Pool Cooling and Fuel Handling and Storage Systems (Continued)								
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
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	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
Piping (including sparger)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping (including sparger)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	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 – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	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

Table 3.3.2-14-1
Circulating Water System (CWS)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-1: 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	System Walkdown	VIII.H-10 (S-42)	3.4.1-28	A
Expansion joint	Pressure boundary	Elastomer	Condensation (ext)	Cracking	Periodic Surveillance and Preventive Maintenance			F
Expansion joint	Pressure boundary	Elastomer	Condensation (ext)	Change in material properties	Periodic Surveillance and Preventive Maintenance			F
Expansion joint	Pressure boundary	Elastomer	Raw water (int)	Cracking	Periodic Surveillance and Preventive Maintenance			F
Expansion joint	Pressure boundary	Elastomer	Raw water (int)	Change in material properties	Periodic Surveillance and Preventive Maintenance			F
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	System Walkdown	VIII.H-10 (S-42)	3.4.1-28	A
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.E-6 (S-24)	3.4.1-31	E

Table 3.3.2-14-1: Circulating Water System (Continued)

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	Raw water (int)	Loss of material	Selective Leaching	VIII.A-7 (SP-28)	3.4.1-36	C
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	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
Piping	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	System Walkdown			G
Piping	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.A-4 (SP-31)	3.4.1-32	E
Piping	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VIII.A-6 (SP-30)	3.4.1-35	C
Piping	Pressure boundary	Plastic	Condensation (ext)	None	None			F
Piping	Pressure boundary	Plastic	Raw water (int)	None	None			F
Pump casing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	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

Table 3.3.2-14-1: Circulating Water System (Continued)

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	Condensation (ext)	None	None			G
Sight glass	Pressure boundary	Glass	Raw water (int)	None	None	VIII.I-7 (SP-34)	3.4.1-40	A
Strainer housing	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	System Walkdown			G
Strainer housing	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.A-4 (SP-31)	3.4.1-32	E
Strainer housing	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VIII.A-6 (SP-30)	3.4.1-35	C
Tank	Pressure boundary	Plastic	Condensation (ext)	None	None			F
Tank	Pressure boundary	Plastic	Raw water (int)	None	None			F
Thermowell	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VIII.H-10 (S-42)	3.4.1-28	A
Thermowell	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
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E

Table 3.3.2-14-1: Circulating Water System (Continued)								
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	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.E-27 (SP-36)	3.4.1-32	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown			G
Tubing	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.A-4 (SP-31)	3.4.1-32	E
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	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	VIII.E-27 (SP-36)	3.4.1-32	E
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	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
Valve body	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	System Walkdown			G
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.A-4 (SP-31)	3.4.1-32	E

Table 3.3.2-14-1: Circulating Water System (Continued)

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	Selective Leaching	VIII.A-6 (SP-30)	3.4.1-35	C
Valve body	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	System Walkdown	VIII.H-10 (S-42)	3.4.1-28	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.G-36 (S-12)	3.4.1-8	E
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VIII.A-7 (SP-28)	3.4.1-36	C

Table 3.3.2-14-2
Compressed Air System (CAS)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-2: Compressed 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air—untreated (int)	Loss of material	One-Time Inspection	VII.D-2 (A-26)	3.3.1-53	E, 303
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	Air—untreated (int)	Loss of material	One-Time Inspection	VII.G-9 (AP-78)	3.3.1-28	E, 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	Air—untreated (int)	Loss of material	One-Time Inspection	VII.D-4 (AP-81)	3.3.1-54	E, 303
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air—indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

Table 3.3.2-14-2: Compressed Air System (Continued)

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 < 15% Zn	Air—untreated (int)	Loss of material	One-Time Inspection	VII.G-9 (AP-78)	3.3.1-28	E, 303
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—untreated (int)	Loss of material	One-Time Inspection	VII.D-4 (AP-81)	3.3.1-54	E, 303
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air—untreated (int)	Loss of material	One-Time Inspection	VII.D-2 (A-26)	3.3.1-53	E, 303
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	One-Time Inspection	VII.G-9 (AP-78)	3.3.1-28	E, 303
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)	Loss of material	One-Time Inspection	VII.D-4 (AP-81)	3.3.1-54	E, 303

Table 3.3.2-14-3
Condensate System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-3: 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	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E-7 (S-18)	3.4.1-5	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C

Table 3.3.2-14-3: Condensate System (Continued)								
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 > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E-7 (S-18)	3.4.1-5	A
Orifice	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Orifice	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Orifice	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
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 (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	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	A
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
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	A
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C

Table 3.3.2-14-3: Condensate System (Continued)								
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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
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
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E-35 (S-16)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
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
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

Table 3.3.2-14-3: Condensate System (Continued)

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 > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	A
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
Pump casing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
Pump casing	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Pump casing	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Sight glass	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
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

Table 3.3.2-14-3: Condensate System (Continued)								
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—indoor (ext)	Loss of material	System Walkdown	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
Strainer housing	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Tank	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
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
Tank	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Tank	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Thermowell	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Thermowell	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C

Table 3.3.2-14-3: Condensate System (Continued)								
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 > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	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	A
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
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
Tubing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Tubing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Tubing	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TTLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C

Table 3.3.2-14-3: Condensate System (Continued)

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	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
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
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
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
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	A
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
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

Table 3.3.2-14-3: Condensate System (Continued)								
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 > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (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 > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
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
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
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
Valve body	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	A
Valve body	Pressure boundary	Stainless steel	Treated water > 270°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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A

Table 3.3.2-14-4
Condensate Demineralizer System (CDS)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management

Table 3.3.2-14-4: Condensate Demineralizer 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	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
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	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
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 (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
Piping	Pressure boundary	Copper alloy > 15% Zn	Air—indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A

Table 3.3.2-14-4: Condensate Demineralizer System (Continued)								
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	Treated water (int)	Loss of material	Selective Leaching	VIII.E-21 (SP-55)	3.4.1-35	A
Piping	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-5 (SP-61)	3.4.1-15	C
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
Sight glass	Pressure boundary	Carbon steel	Air-indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09	3.4.1-4	A
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
Strainer housing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
Tank	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.3.2-14-4: Condensate Demineralizer System (Continued)								
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
Tubing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Tubing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
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
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	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
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	Treated water (int)	Loss of material	Selective Leaching	VIII.E-21 (SP-55)	3.4.1-35	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-5 (SP-61)	3.4.1-15	C
Valve body	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.3.2-14-4: Condensate Demineralizer System (Continued)								
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	VIII.E-29 (SP-16)	3.4.1-16	A

Table 3.3.2-14-5
Condensate Storage and Transfer System (CST)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-5: Condensate Storage and Transfer 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	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
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	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Filter 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
Filter housing	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Filter housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
Orifice	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Orifice	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.3.2-14-5: Condensate Storage and Transfer System (Continued)								
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	VIII.E-29 (SP-16)	3.4.1-16	A
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
Pump casing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
Pump casing	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
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

Table 3.3.2-14-5: Condensate Storage and Transfer System (Continued)								
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	VIII.I-10 (SP-12)	3.4.1-41	A
Strainer housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
Thermowell	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	A
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
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	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
Valve body	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.3.2-14-5: Condensate Storage and Transfer System (Continued)								
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	VIII.E-29 (SP-16)	3.4.1-16	A

Table 3.3.2-14-6
Control Rod Drive System (CRD)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-6: 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
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	System Walkdown	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 – BWR	VII.E3-18 (A-35)	3.3.1-17	C
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Orifice	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Orifice	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-14-6: Control Rod Drive System (Continued)								
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.E3-15 (A-58)	3.3.1-24	C
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
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.E3-15 (A-58)	3.3.1-24	C
Pump casing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
Strainer housing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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	C
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.E3-15 (A-58)	3.3.1-24	C

Table 3.3.2-14-6: Control Rod Drive System (Continued)								
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	System Walkdown	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
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.E3-15 (A-58)	3.3.1-24	C

**Table 3.3.2-14-7
Core Spray System (CS)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.3.2-14-7: 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	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
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	System Walkdown	V.D2-2 (E-26)	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
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
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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
Valve body	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.3.2-14-7: Core Spray System (Continued)

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.D2-28 (EP-32)	3.2.1-5	A

Table 3.3.2-14-8
Emergency Diesel Generator System (EDG)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-8: 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Compressor housing	Pressure boundary	Carbon steel	Air—untreated (int)	Loss of material	One-Time Inspection	VII.D-2 (A-26)	3.3.1-53	E, 303
Filter housing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Air—untreated (int)	Loss of material	One-Time Inspection	VII.D-2 (A-26)	3.3.1-53	E, 303
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air—untreated (int)	Loss of material	One-Time Inspection	VII.D-2 (A-26)	3.3.1-53	E, 303
Piping	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-14-8: Emergency Diesel Generator System (Continued)								
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—untreated (int)	Cracking	One-Time Inspection			G
Piping	Pressure boundary	Stainless steel	Air—untreated (int)	Loss of material	One-Time Inspection			G
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air—untreated (int)	Loss of material	One-Time Inspection	VII.D-2 (A-26)	3.3.1-53	E, 303
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)	Cracking	One-Time Inspection			G
Valve body	Pressure boundary	Stainless steel	Air—untreated (int)	Loss of material	One-Time Inspection			G

Table 3.3.2-14-9
Extraction Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-9: 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	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
Bolting	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Expansion Joint	Pressure boundary	Nickel alloy	Air—indoor (ext)	None	None	VIII.I-9 (SP-11)	3.4.1-41	A
Expansion Joint	Pressure boundary	Nickel alloy	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR			G
Expansion Joint	Pressure boundary	Nickel alloy	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR			G
Expansion Joint	Pressure boundary	Nickel alloy	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR			G
Expansion Joint	Pressure boundary	Nickel alloy	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			G
Expansion Joint	Pressure boundary	Nickel alloy	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR			G
Expansion Joint	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR			G

Table 3.3.2-14-9: Extraction Steam System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Expansion Joint	Pressure boundary	Nickel alloy	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR			G
Expansion Joint	Pressure boundary	Nickel alloy	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR			G
Expansion Joint	Pressure boundary	Nickel alloy	Treated Water > 270°F (int)	Cracking	Water Chemistry Control – BWR			G
Expansion Joint	Pressure boundary	Nickel alloy	Treated Water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			G
Expansion Joint	Pressure boundary	Nickel alloy	Treated Water > 270°F (int)	Loss of material	Water Chemistry Control – BWR			G
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.C-5 (S-15)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	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.C-6 (S-09)	3.4.1-4	A

Table 3.3.2-14-9: Extraction Steam System (Continued)								
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 > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-6 (S-09)	3.4.1-4	A
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 > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			H
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (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	VIII.C-1 (SP-16)	3.4.1-16	A
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
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
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C

Table 3.3.2-14-9: Extraction Steam System (Continued)								
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 > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	A
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.C-5 (S-15)	3.4.1-29	A
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	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.C-6 (S-09)	3.4.1-4	A
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (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 > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-6 (S-09)	3.4.1-4	A

Table 3.3.2-14-9: Extraction Steam System (Continued)								
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	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Valve body	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			H
Valve body	Pressure boundary	Stainless steel	Steam > 270°F (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	VIII.C-1 (SP-16)	3.4.1-16	A
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
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
Valve body	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C
Valve body	Pressure boundary	Stainless steel	Treated water > 270°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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	A

Table 3.3.2-14-10
Feedwater System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-10: 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	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
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	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
Filter housing	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Filter housing	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C

Table 3.3.2-14-10: Feedwater System (Continued)								
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 – BWR	VIII.E-7 (S-18)	3.4.1-5	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-7 (S-18)	3.4.1-5	C
Orifice	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	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
Orifice	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Orifice	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
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 (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	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
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

Table 3.3.2-14-10: Feedwater System (Continued)								
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 > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	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
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
Strainer housing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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.D2-7 (S-09)	3.4.1-4	A

Table 3.3.2-14-10: Feedwater System (Continued)								
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 > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Strainer housing	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
Tank	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
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
Tank	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Tank	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-40 (S-13)	3.4.1-6	C
Thermowell	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
Thermowell	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Thermowell	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
Thermowell	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.3.2-14-10: Feedwater System (Continued)								
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	VIII.D2-4 (SP-16)	3.4.1-16	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
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
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A
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.D2-4 (SP-16)	3.4.1-16	A
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
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
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C

Table 3.3.2-14-10: Feedwater System (Continued)								
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 > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	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
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (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 > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
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.D2-4 (SP-16)	3.4.1-16	A
Valve body	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C

Table 3.3.2-14-10: Feedwater System (Continued)								
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 > 270°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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A

Table 3.3.2-14-11
Feedwater Heater Drains and Vents System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-11: Feedwater Heater Drains and Vents 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	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
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	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Orifice	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Orifice	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
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
Orifice	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Orifice	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
Orifice	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.3.2-14-11: Feedwater Heater Drains and Vents System (Continued)								
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	VIII.D2-4 (SP-16)	3.4.1-16	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
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
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.C-5 (S-15)	3.4.1-29	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	A

Table 3.3.2-14-11: Feedwater Heater Drains and Vents System (Continued)								
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.D2-7 (S-09)	3.4.1-4	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
Sight glass	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Sight glass	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Sight glass	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
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
Tank	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Tank	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C

Table 3.3.2-14-11: Feedwater Heater Drains and Vents System (Continued)								
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	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
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
Tank	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Tank	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-40 (S-13)	3.4.1-6	C
Thermowell	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Thermowell	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
Thermowell	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Thermowell	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
Thermowell	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.3.2-14-11: Feedwater Heater Drains and Vents System (Continued)								
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	VIII.D2-4 (SP-16)	3.4.1-16	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
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
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A
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.D2-4 (SP-16)	3.4.1-16	A
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
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
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C

Table 3.3.2-14-11: Feedwater Heater Drains and Vents System (Continued)								
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 > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.C-5 (S-15)	3.4.1-29	C
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	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	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
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (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 > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A

Table 3.3.2-14-11: Feedwater Heater Drains and Vents System (Continued)								
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	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.D2-4 (SP-16)	3.4.1-16	A
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
Valve body	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
Valve body	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C
Valve body	Pressure boundary	Stainless steel	Treated water > 270°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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-4 (SP-16)	3.4.1-16	A

Table 3.3.2-14-12
Fire Protection System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-12: 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Nozzle	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Nozzle	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Fire Water System			G, 306
Nozzle	Pressure boundary	Copper alloy > 15% Zn	Air—indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Nozzle	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Fire Water System			G, 306
Nozzle	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.A4-9 (AP-32)	3.3.1-84	C, 308
Orifice	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Fire Water System			G, 306

Table 3.3.2-14-12: Fire Protection System (Continued)								
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	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	Fire Water System			G, 306
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Fire Water System			G, 306
Tank	Pressure boundary	Gray cast iron	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Water System			G, 306
Tank	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.G-16 (AP-31)	3.3.1-85	A, 308
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air—indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Fire Water System			G, 306
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	Fire Water System			G, 306

Table 3.3.2-14-12: Fire Protection System (Continued)								
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Fire Water System			G, 306
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	Fire Water System			G, 306
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, 308
Valve body	Pressure boundary	Gray cast iron	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Fire Water System			G, 306
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.G-16 (AP-31)	3.3.1-85	A, 308
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	Fire Water System			G, 306

Table 3.3.2-14-13
Fuel Oil (FO) Storage and Transfer System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-13: Fuel Oil Storage and Transfer 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter 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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	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
Pump casing	Pressure boundary	Gray cast iron	Air—indoor (ext)	Loss of material	System Walkdown	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
Tubing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-14-13: Fuel Oil Storage and Transfer System (Continued)								
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	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	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	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	System Walkdown	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 3.3.2-14-14
Fuel Pool Cooling (FPC) and Demineralizer System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-14: Fuel Pool Cooling and Demineralizer 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Orifice	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Orifice	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-14-14: Fuel Pool Cooling and Demineralizer System (Continued)								
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
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
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
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 (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Tank	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A

Table 3.3.2-14-14: Fuel Pool Cooling and Demineralizer System (Continued)								
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	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
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 – BWR	VII.A4-11 (A-58)	3.3.1-24	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 – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
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

Table 3.3.2-14-15
Heating Ventilation and Air Conditioning Systems (HVAC)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-15: 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	System Walkdown	VII.F2-4 (A-105)	3.3.1-55	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	System Walkdown	VII.F2-2 (A-10)	3.3.1-56	A
Damper housing	Pressure boundary	Carbon steel	Air—indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
Duct	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.F2-2 (A-10)	3.3.1-56	A
Duct	Pressure boundary	Carbon steel	Air—indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
Expansion joint	Pressure boundary	Elastomer	Air—indoor (ext)	Change in material properties	Periodic Surveillance and Preventive Maintenance	VII.F2-7 (A-17)	3.3.1-11	E
Expansion joint	Pressure boundary	Elastomer	Air—indoor (ext)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.F2-7 (A-17)	3.3.1-11	E

Table 3.3.2-14-15: Heating Ventilation and Air Conditioning Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Expansion joint	Pressure boundary	Elastomer	Treated water (int)	Change in material properties	Periodic Surveillance and Preventive Maintenance			G, 302
Expansion joint	Pressure boundary	Elastomer	Treated water (int)	Cracking	Periodic Surveillance and Preventive Maintenance			G, 302
Filter housing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.F2-2 (A-10)	3.3.1-56	A
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F2-18 (A-25)	3.3.1-47	B
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.F2-2 (A-10)	3.3.1-56	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F2-9 (A-63)	3.3.1-48	B
Heat exchanger (shell)	Pressure boundary	Copper alloy > 15% Zn	Air—indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	C
Heat exchanger (shell)	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F2-14 (A-46)	3.3.1-25	E

Table 3.3.2-14-15: Heating Ventilation and Air Conditioning Systems (Continued)								
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	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
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.F2-2 (A-10)	3.3.1-56	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F2-18 (A-25)	3.3.1-47	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
Pump casing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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 – Closed Cooling Water	VII.F2-18 (A-25)	3.3.1-47	B
Strainer housing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.F2-2 (A-10)	3.3.1-56	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F2-18 (A-25)	3.3.1-47	B

Table 3.3.2-14-15: Heating Ventilation and Air Conditioning Systems (Continued)								
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	System Walkdown	VII.F2-2 (A-10)	3.3.1-56	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F2-18 (A-25)	3.3.1-47	B
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air—indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F2-13 (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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.F2-2 (A-10)	3.3.1-56	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F2-18 (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

Table 3.3.2-14-15: Heating Ventilation and Air Conditioning Systems (Continued)								
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	D

Table 3.3.2-14-16
High Pressure Coolant Injection System (HPCI)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-16: 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	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
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	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Orifice	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Orifice	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			H
Orifice	Pressure boundary	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C

Table 3.3.2-14-16: High Pressure Coolant Injection System (Continued)

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	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
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
Rupture disk	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Rupture disk	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Rupture disk	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	C
Rupture disk	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
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	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Rupture disk	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			H

Table 3.3.2-14-16: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Rupture disk	Pressure boundary	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C
Rupture disk	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
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
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-3 (S-04)	3.4.1-2	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	A
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 (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.3.2-14-17
Main Condenser
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-17: Main Condenser 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	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
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	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Orifice	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Orifice	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-29 (SP-16)	3.4.1-16	C
Orifice	Pressure boundary	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C

Table 3.3.2-14-17: Main Condenser System (Continued)								
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 > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C
Orifice	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			H
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A-17 (S-15)	3.4.1-29	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E-35 (S-16)	3.4.1-29	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	C
Steam trap	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A-17 (S-15)	3.4.1-29	C

Table 3.3.2-14-17: Main Condenser System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Tank	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	C
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A-17 (S-15)	3.4.1-29	C
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E-35 (S-16)	3.4.1-29	C
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	C

Table 3.3.2-14-18
Main Steam System (MS)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-18: 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	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
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	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Orifice	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Orifice	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-6 (S-09)	3.4.1-4	A
Orifice	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Orifice	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-6 (S-09)	3.4.1-4	A
Orifice	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.3.2-14-18: Main Steam System (Continued)								
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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	A
Orifice	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	A
Orifice	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			H
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	C
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 270° F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	C
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A

Table 3.3.2-14-18: Main Steam System (Continued)								
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.B2-6 (S-09)	3.4.1-4	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D2-8 (S-16)	3.4.1-29	C
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-6 (S-09)	3.4.1-4	A
Steam trap	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	A
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A
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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	A

Table 3.3.2-14-18: Main Steam System (Continued)								
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 > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	A
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			H
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.C-1 (SP-16)	3.4.1-16	C
Turbine casing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Turbine casing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Turbine casing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A

Table 3.3.2-14-18: Main Steam System (Continued)								
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 > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	A
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (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)	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
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (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 > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-6 (S-09)	3.4.1-4	A

Table 3.3.2-14-19
Offgas and Augmented Offgas System (AOG)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-19: Offgas and Augmented Offgas 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Ejector	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Ejector	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Ejector	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C

Table 3.3.2-14-19: Offgas and Augmented Offgas System (Continued)

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 > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Orifice	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Orifice	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A-17 (S-15)	3.4.1-29	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E-35 (S-16)	3.4.1-29	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
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C

Table 3.3.2-14-19: Offgas and Augmented Offgas System (Continued)

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 > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E-35 (S-16)	3.4.1-29	C
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Pump casing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Pump casing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
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
Pump casing	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Pump casing	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Tank	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
Thermowell	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-14-19: Offgas and Augmented Offgas System (Continued)								
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	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	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	C
Thermowell	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
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	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C
Thermowell	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			H
Thermowell	Pressure boundary	Stainless steel	Steam > 270°F (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 (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	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

Table 3.3.2-14-19: Offgas and Augmented Offgas System (Continued)								
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)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
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	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			H
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (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	VII.A4-11 (A-58)	3.3.1-24	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
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

Table 3.3.2-14-19: Offgas and Augmented Offgas System (Continued)								
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 > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A-17 (S-15)	3.4.1-29	C
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E-35 (S-16)	3.4.1-29	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
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E-35 (S-16)	3.4.1-29	C

Table 3.3.2-14-19: Offgas and Augmented Offgas System (Continued)								
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 > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
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	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C
Valve body	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue			H
Valve body	Pressure boundary	Stainless steel	Steam > 270°F (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	VII.A4-11 (A-58)	3.3.1-24	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
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
Valve body	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.E-31 (SP-19)	3.4.1-14	C
Valve body	Pressure boundary	Stainless steel	Treated water > 270°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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C

Table 3.3.2-14-20
Post-Accident Sampling System (PASS)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-20: Post-Accident Sampling 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
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	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F3-8 (AP-34)	3.3.1-51	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	Air—indoor (int)	None	None			G
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
Piping	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

Table 3.3.2-14-20: Post-Accident Sampling System (Continued)								
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	Air—indoor (int)	None	None			G
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
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 – BWR	VII.A4-11 (A-58)	3.3.1-24	C
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	D

Table 3.3.2-14-21
Potable and Sanitary Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-21: Potable and Sanitary 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Orifice	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
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 – Auxiliary Systems			J, 309
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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			J, 309

Table 3.3.2-14-21: Potable and Sanitary Water System (Continued)								
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	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E
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	Treated water (int)	Loss of material	Selective Leaching	VII.A4-9 (AP-32)	3.3.1-84	C, 308
Piping	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Piping	Pressure boundary	Copper alloy > 15% Zn	Untreated water (int)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	C
Piping	Pressure boundary	Copper alloy > 15% Zn	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-9 (A-44)	3.3.1-81	E
Piping	Pressure boundary	Plastic	Air—indoor (ext)	None	None			F
Piping	Pressure boundary	Plastic	Untreated water (int)	None	None			F
Pump casing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-14-21: Potable and Sanitary Water System (Continued)								
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 – Auxiliary Systems			J, 309
Pump casing	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E
Strainer housing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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 – Auxiliary Systems			J, 309
Strainer housing	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air—indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Tubing	Pressure boundary	Copper alloy < 15% Zn	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-9 (A-44)	3.3.1-81	E
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-14-21: Potable and Sanitary Water System (Continued)								
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 – Auxiliary Systems			J, 309
Valve body	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	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	Treated water (int)	Loss of material	Selective Leaching	VII.A4-9 (AP-32)	3.3.1-84	C, 308
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Valve body	Pressure boundary	Copper alloy > 15% Zn	Untreated water (int)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-9 (A-44)	3.3.1-81	E

**Table 3.3.2-14-22
Primary Containment Atmospheric Control System (PCAC)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.3.2-14-22: Primary Containment Atmospheric 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air—indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	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	Air—indoor (int)	None	None			G
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air—indoor (int)	Loss of material	System Walkdown	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

Table 3.3.2-14-22: Primary Containment Atmospheric Control System (Continued)								
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	Air—indoor (int)	None	None			G

Table 3.3.2-14-23
Radioactive Waste System
Summary of Aging Management Evaluation

Table 3.3.2-14-23: Radioactive Waste 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
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	System Walkdown	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 – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Filter housing	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Filter housing	Pressure boundary	Stainless steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E
Flex joint	Pressure boundary	Elastomer	Air—indoor (ext)	Change in material properties	Periodic Surveillance and Preventive Maintenance	VII.F2-7 (A-17)	3.3.1-11	E

Table 3.3.2-14-23: Radioactive Waste System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flex joint	Pressure boundary	Elastomer	Air—indoor (ext)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.F2-7 (A-17)	3.3.1-11	E
Flex joint	Pressure boundary	Elastomer	Untreated water (int)	Change in material properties	Periodic Surveillance and Preventive Maintenance	VII.C1-1 (AP-75)	3.3.1-75	E
Flex joint	Pressure boundary	Elastomer	Untreated water (int)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.C1-1 (AP-75)	3.3.1-75	E
Orifice	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Orifice	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Orifice	Pressure boundary	Stainless steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E

Table 3.3.2-14-23: Radioactive Waste System (Continued)								
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	System Walkdown	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
Piping	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E
Piping	Pressure boundary	Plastic	Air—indoor (ext)	None	None			F
Piping	Pressure boundary	Plastic	Untreated water (int)	None	None			F
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	C
Piping	Pressure boundary	Stainless steel	Untreated 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	System Walkdown	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

Table 3.3.2-14-23: Radioactive Waste System (Continued)								
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	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E
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 (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Pump casing	Pressure boundary	Stainless steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E
Sight glass	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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	C
Sight glass	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E
Sight glass	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Sight glass	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Sight glass	Pressure boundary	Stainless steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E

Table 3.3.2-14-23: Radioactive Waste System (Continued)								
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
Sight glass	Pressure boundary	Glass	Untreated 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	System Walkdown	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
Tank	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Tank	Pressure boundary	Stainless steel	Untreated 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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C

Table 3.3.2-14-23: Radioactive Waste System (Continued)								
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	Untreated 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	System Walkdown	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
Valve body	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Stainless steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E

Table 3.3.2-14-24
Reactor Building Closed Cooling Water System (RBCCW)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-24: Reactor Building Closed 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
Tank	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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 3.3.2-14-25
Reactor Core Isolation Cooling System (RCIC)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-25: 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	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
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	System Walkdown	V.D2-2 (E-26)	3.2.1-31	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	A

Table 3.3.2-14-25: Reactor Core Isolation Cooling System (Continued)								
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 > 220°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
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
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
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 (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.3.2-14-26
Reactor Coolant System (RCS)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-26: 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	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
Piping	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
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
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C

Table 3.3.2-14-26: Reactor Coolant System (Continued)								
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	C
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	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
Valve body	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
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
Valve body	Pressure boundary	Stainless steel	Treated water > 270°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 > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C

Table 3.3.2-14-26: Reactor Coolant System (Continued)								
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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C

Table 3.3.2-14-27
Reactor Water Cleanup System (RWCU)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-27: 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
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	System Walkdown	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 – BWR	VII.E3-18 (A-35)	3.3.1-17	A
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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.E3-18 (A-35)	3.3.1-17	C

Table 3.3.2-14-27: Reactor Water Cleanup System (Continued)								
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.E3-18 (A-35)	3.3.1-17	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Heat exchanger (shell)	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	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Orifice	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-14-27: Reactor Water Cleanup System (Continued)								
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	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-17	A
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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	A
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.E3-15 (A-58)	3.3.1-24	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)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A

Table 3.3.2-14-27: Reactor Water Cleanup System (Continued)								
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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
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 (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
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 (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
Thermowell	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
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
Thermowell	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	A

Table 3.3.2-14-27: Reactor Water Cleanup System (Continued)								
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	VII.J-15 (AP-17)	3.3.1-94	A
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Thermowell	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
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	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 – BWR	VII.E3-15 (A-58)	3.3.1-24	A
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)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A

Table 3.3.2-14-27: Reactor Water Cleanup System (Continued)								
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 > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	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)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
Valve body	Pressure boundary	Stainless steel	Treated water > 270°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 > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A

Table 3.3.2-14-27: Reactor Water Cleanup System (Continued)								
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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A

Table 3.3.2-14-28
Residual Heat Removal System (RHR)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-28: 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	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	V.D2-2 (E-26)	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

Table 3.3.2-14-29
Salt Service Water System (SSW)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-29: Salt 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	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	C
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Filter housing	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Filter housing	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	A
Filter housing	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
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	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	B
Piping	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Piping	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	A

Table 3.3.2-14-29: Salt Service Water System (Continued)								
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	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	B
Piping	Pressure boundary	Plastic	Condensation (ext)	None	None			F
Piping	Pressure boundary	Plastic	Raw water (int)	None	None			F
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (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	B
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	C
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	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	System Walkdown	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	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E

Table 3.3.2-14-29: Salt Service Water System (Continued)								
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 3.3.2-14-30
Sampling Systems
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-30: 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Filter 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
Filter 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
Heat exchanger (coil)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
Heat exchanger (coil)	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

Table 3.3.2-14-30: Sampling Systems (Continued)								
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)	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 (coil)	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
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
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	C
Piping	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
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
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C

Table 3.3.2-14-30: Sampling Systems (Continued)								
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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
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 (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
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
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
Sight glass	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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	C
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
Sight glass	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Sight glass	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C

Table 3.3.2-14-30: Sampling Systems (Continued)								
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	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
Sight glass	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Sight glass	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
Tank	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Tank	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Tank	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
Tank	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Tank	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C

Table 3.3.2-14-30: Sampling Systems (Continued)								
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	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Thermowell	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Thermowell	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
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 – BWR	VII.A4-11 (A-58)	3.3.1-24	C
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
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C

Table 3.3.2-14-30: Sampling Systems (Continued)								
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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
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	C
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
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking - fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
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 3.3.2-14-30: Sampling Systems (Continued)

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 > 220°F (int)	Cracking - fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
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	C
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	D
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
Valve body	Pressure boundary	Stainless steel	Treated water > 270°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 > 270°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 > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C

Table 3.3.2-14-31
Sanitary Soiled Waste and Vent; Plumbing and Drains
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-31: Sanitary Soiled Waste and Vent; Plumbing and 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E
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	Untreated 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 > 15% Zn	Untreated water (int)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	C
Piping	Pressure boundary	Gray cast iron	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Gray cast iron	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E

Table 3.3.2-14-31: Sanitary Soiled Waste and Vent; Plumbing and Drains (Continued)								
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	Untreated water (int)	Loss of material	Selective Leaching	VII.C1-11 (A-51)	3.3.1-85	C
Piping	Pressure boundary	Plastic	Air—indoor (ext)	None	None			F
Piping	Pressure boundary	Plastic	Untreated water (int)	None	None			F
Pump casing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E
Pump casing	Pressure boundary	Gray cast iron	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Gray cast iron	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E
Pump casing	Pressure boundary	Gray cast iron	Untreated water (int)	Loss of material	Selective Leaching	VII.C1-11 (A-51)	3.3.1-85	C
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	Untreated water (int)	Loss of material	One-Time Inspection	VII.C1-15 (A-54)	3.3.1-79	E

Table 3.3.2-14-31: Sanitary Soiled Waste and Vent; Plumbing and Drains (Continued)								
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	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	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-9 (A-44)	3.3.1-81	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Untreated water (int)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	C
Valve body	Pressure boundary	Gray cast iron	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E
Valve body	Pressure boundary	Gray cast iron	Untreated water (int)	Loss of material	Selective Leaching	VII.C1-11 (A-51)	3.3.1-85	C

Table 3.3.2-14-32
Screen Wash System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-32: Screen Wash 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	System Walkdown	VII.I-11 (A-81)	3.3.1-58	C
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Orifice	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	C
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
Orifice	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Orifice	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	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	C
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

Table 3.3.2-14-32: Screen Wash System (Continued)								
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	Nickel alloy	Condensation (ext)	Loss of material	System Walkdown			G
Piping	Pressure boundary	Nickel alloy	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-13 (AP-53)	3.3.1-78	E
Piping	Pressure boundary	Plastic	Condensation (ext)	None	None			F
Piping	Pressure boundary	Plastic	Raw water (int)	None	None			F
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	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
Pump casing	Pressure boundary	Carbon steel with stainless steel lining	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	C
Pump casing	Pressure boundary	Carbon steel with stainless steel lining	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	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E

Table 3.3.2-14-32: Screen Wash System (Continued)								
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	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	C
Strainer housing	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
Tubing	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Tubing	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
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	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
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	C
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	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E

Table 3.3.2-14-32: Screen Wash System (Continued)								
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	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	C
Valve body	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
Valve body	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	C
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	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E
Valve body	Pressure boundary	Plastic	Condensation (ext)	None	None			F
Valve body	Pressure boundary	Plastic	Raw water (int)	None	None			F
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	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

Table 3.3.2-14-33
Standby Liquid Control System (SLC)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-33: 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
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 (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
Tank	Pressure boundary	Plastic	Air—indoor (ext)	None	None			F
Tank	Pressure boundary	Plastic	Sodium pentaborate (int)	None	None			F
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 (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A

Table 3.3.2-14-34
Turbine Building Closed Cooling Water System (TBCCW)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-34: Turbine Building Closed 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	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Compressor 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
Filter housing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
Flex joint	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Flex joint	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 3.3.2-14-34: Turbine Building Closed Cooling Water System (Continued)								
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	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
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 (shell)	Pressure boundary	Gray cast iron	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	C
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 (shell)	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	D
Orifice	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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

Table 3.3.2-14-34: Turbine Building Closed Cooling Water System (Continued)								
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	System Walkdown	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	System Walkdown	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	B
Strainer housing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
Tank	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
Thermowell	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-14-34: Turbine Building Closed Cooling Water System (Continued)								
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 – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
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	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	B
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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	Plastic	Air—indoor (ext)	None	None			F
Valve body	Pressure boundary	Plastic	Treated water (int)	None	None			F

Table 3.3.2-14-34: Turbine Building Closed Cooling Water System (Continued)								
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	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 – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	B

Table 3.3.2-14-35
Turbine Generator and Auxiliaries System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-14-35: Turbine Generator and Auxiliary 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	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
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	System Walkdown	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
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Filter housing	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Filter housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.3.2-14-35: Turbine Generator and Auxiliary System (Continued)								
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	Lube oil (int)	Loss of material	Oil Analysis	VIII.G-3 (S-20)	3.4.1-19	E
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Heater housing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Heater housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-14 (SP-25)	3.4.1-7	E
Heater housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Orifice	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Orifice	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-14 (SP-25)	3.4.1-7	E
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-9 (SP-38)	3.4.1-19	E

Table 3.3.2-14-35: Turbine Generator and Auxiliary System (Continued)								
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 – Auxiliary Systems			J, 309
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
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	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
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	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Pump casing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-14 (SP-25)	3.4.1-7	E
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309

Table 3.3.2-14-35: Turbine Generator and Auxiliary System (Continued)								
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	VIII.I-10 (SP-12)	3.4.1-41	A
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Sight glass	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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	Copper alloy > 15% Zn	Air—indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
Sight glass	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-3 (SP-32)	3.4.1-18	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
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VIII.I-8 (SP-35)	3.4.1-40	A
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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-9 (SP-38)	3.4.1-19	E

Table 3.3.2-14-35: Turbine Generator and Auxiliary System (Continued)								
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	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Tank	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	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
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Tank	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tank	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Thermowell	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Thermowell	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-14 (SP-25)	3.4.1-7	E
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309

Table 3.3.2-14-35: Turbine Generator and Auxiliary System (Continued)								
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			J, 309
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air—indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VIII.A-3 (SP-32)	3.4.1-18	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
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
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
Valve body	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.3.2-14-35: Turbine Generator and Auxiliary System (Continued)								
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	VIII.A-14 (SP-25)	3.4.1-7	E
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			J, 309
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			J, 309

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. With the exception of the condensate storage system, these systems are within the scope of license renewal primarily due to their support of the MSIV leakage pathway. Components in the MSIV leakage pathway are credited with dose reduction under accident conditions for offsite dose and control room habitability considerations. The boundary for the MSIV leakage pathway starts at the main steam piping at the reactor building wall and includes the piping and components up to and including the main condenser that form a pathway for steam and condensate to the main condenser. The boundary includes the turbine stop valves, turbine bypass valves, and drain lines for the main steam lines.

The following systems are addressed in this section (system descriptions are available in the referenced sections).

- condensate storage system (Section 2.3.4.1)
- main steam (Section 2.3.4.2)
- turbine-generator and auxiliaries (Section 2.3.4.3)
- main condenser (Section 2.3.4.4)

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 and the main condenser and MSIV leakage pathway.

- Table 3.4.2-1 Condensate Storage (CS) System—Summary of Aging Management Evaluation

- Table 3.4.2-2 Main Condenser and MSIV Leakage Pathway—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 condensate storage system and the main condenser and MSIV leakage pathway. 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
- gray cast iron
- stainless steel

Environment

Condensate storage system components are exposed to the following environments.

- air—indoor
- air—outdoor
- 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 effects of aging on condensate storage system components.

- Buried Piping and Tanks Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- System Walkdown
- Water Chemistry Control – BWR

3.4.2.1.2 Main Condenser and MSIV Leakage Pathway

Materials

Main condenser and MSIV leakage pathway components are constructed of the following materials.

- carbon steel
- copper alloy
- elastomer
- titanium
- stainless steel

Environment

Main condenser and MSIV leakage pathway components are exposed to the following environments.

- air—indoor
- raw water
- treated water
- steam > 270°F

Aging Effects Requiring Management

The following aging effects associated with the main condenser and MSIV leakage pathway require management.

- cracking
- cracking—fatigue
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on main condenser and MSIV leakage pathway components.

- Flow-Accelerated Corrosion
- System Walkdown
- 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. Section 3.4.2.2 of NUREG-1800 discusses these aging effects and other issues that require further evaluation. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the approach to these 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 (cracking-fatigue), the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs must be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed in Section 4.3 of this application.

3.4.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

1. At PNPS there are no heat exchanger components included in the steam and power conversion systems except for components in scope solely based on criterion 10 CFR 54.4(a)(2). The condensers are included as part of the main condenser and MSIV leakage pathway but have no aging effects requiring management since their intended function is for holdup and plateout of radioactive materials.

   Loss of material due to general, pitting and crevice corrosion for carbon steel piping, 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 systems at PNPS, and is managed by the Water Chemistry Control – BWR and Periodic Surveillance and Preventive Maintenance (PSPM) Programs. 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 PSPM Program uses visual inspections and other NDE techniques to manage loss of material for carbon steel tanks in the condensate storage system.

2. Loss of material due to general, pitting and crevice corrosion for steel piping and components in steam and power conversion systems exposed to lubricating oil is managed by the Oil Analysis Program. This aging effect only applies to components in the turbine generator and auxiliary system and is included in the evaluation of systems within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) (see Table 3.3.2-14-35). The Oil Analysis 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. Operating experience at PNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

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, piping components, and piping elements exposed to raw water is managed by the Periodic Surveillance and Preventive Maintenance (PSPM) Program. The PSPM Program uses visual inspections and other NDE techniques to manage loss of material for carbon steel components.

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 PNPS 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 and reactor core isolation cooling 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.

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 PNPS 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 Oil Analysis Program for steel heat exchanger tubes in the station blackout diesel generator and security diesel generator systems. The Oil Analysis 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. Operating experience at PNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that fouling has not and will not affect the intended functions of these components.

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 PNPS have no carbon steel components that are exposed to soil. This item is not applicable to PNPS.

2. Loss of material due to general, pitting and crevice corrosion, and MIC could occur in carbon steel heat exchanger components exposed to lubricating oil. The steam and power conversion systems at PNPS have no heat exchanger components that are exposed to lubricating oil. This item is not applicable to PNPS.

3.4.2.2.6 Cracking due to Stress Corrosion Cracking (SCC)

Cracking due to SCC in stainless steel components exposed to steam 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 and copper alloy components exposed to treated water is managed by the Water Chemistry Control – BWR Program. There are no aluminum components in the steam and power conversion 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.

2. Loss of material due to pitting and crevice corrosion for stainless steel piping and tubing exposed to soil 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 components. Buried components will be inspected when excavated during maintenance. An inspection will be performed within 10 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. Loss of material due to pitting and crevice corrosion for copper alloy components in steam and power conversion systems exposed to lubricating oil is managed by the Oil Analysis Program. This aging effect only applies to components in the turbine generator and auxiliary system and is included in the evaluation of systems within the scope of license renewal based on the criterion of 10 CFR

54.4(a)(2) (see Table 3.3.2-14-35). The Oil Analysis 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. Operating experience at PNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

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 for stainless steel components in steam and power conversion systems exposed to lubricating oil is managed by the Oil Analysis Program. This aging effect only applies to components in the turbine generator and auxiliary system and is included in the evaluation of systems within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) (see Table 3.3.2-14-35). The Oil Analysis 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. Operating experience at PNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

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 PNPS quality assurance procedures and administrative controls for aging management programs.

3.4.2.3 Time-Limited Aging Analysis

The only TLAA identified for the steam and power conversion systems components is metal fatigue. This is evaluated in Section 4.3 of this application.

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 aging effects for the steam and power conversion system components are identified in the following tables and Section 3.4.2.1. A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging on steam and power conversion system components will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.4.1
Summary of Aging Management Programs for the Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Table 3.4.1: Steam and Power Conversion System, 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. See Section 3.4.2.2.2 (1).
3.4.1-3	PWR only				

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
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 (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 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. See Section 3.4.2.2.9.

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
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 for components listed in series 3.3.2-14-xx tables (components included in scope only under criterion 10 CFR 54.4(a)(2)). The loss of material in 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. Loss of material will be managed by the Periodic Surveillance and Preventive Maintenance Program for the steel tanks in the condensate storage system. See Section 3.4.2.2.2 (1).

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	The Oil Analysis Program manages loss of material in steel components. 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. See Section 3.4.2.2.2 (2).
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 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. See Section 3.4.2.2.3.

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)

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 only components to which this NUREG-1801 line item applies are in the high pressure coolant injection and reactor core isolation cooling systems in Tables 3.2.2-4 and 3.2.2-5. See Section 3.4.2.2.4 (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	The Oil Analysis Program manages loss of material in steel components. The only components to which this NUREG-1801 line item applies are in the station blackout diesel generator and security diesel generator systems in Tables 3.3.2-5 and 3.3.2-6. See Section 3.4.2.2.4 (2).

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
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 (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	Not applicable. There are no steel heat exchanger components exposed to lubricating oil in the steam and power conversion systems. See Section 3.4.2.2.5 (2).
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. See Section 3.4.2.2.6.

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
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 >60ûC (>140ûF)	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 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. See Section 3.4.2.2.6.

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	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 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. There are no aluminum components in the steam and power conversion systems. See Section 3.4.2.2.7 (1).
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. The 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 (1).

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 will manage loss of material in stainless steel components exposed to soil. See Section 3.4.2.2.7 (2).
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	The Oil Analysis Program manages loss of material in copper alloy components. 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. 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	The Oil Analysis Program manages loss of material in stainless steel components. 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. See Section 3.4.2.2.8.

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-20	Steel tanks exposed to air – outdoor (external)	Loss of material/ general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	The System Walkdown Program manages loss of material in steel tanks exposed to outdoor air though the use of periodic visual inspections.
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 System, NUREG-1801 Vol. 1 (Continued)					
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	The System Walkdown Program manages the loss of material for steel bolting through the use of visual inspections that are performed at least once per refueling cycle. 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 PNPS is standard grade B7 carbon steel, or similar material, except in rare specialized applications such as applications 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 PNPS 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.

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-22 continued					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. To address these bolting operational concerns, PNPS 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 PNPS.
3.4.1-23	Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60ºC (>140ºF)	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.

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Not applicable. There are no stainless steel components exposed to closed cycle cooling water in the steam and power conversion systems.
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	Not applicable. There are no copper alloy components exposed to closed cycle cooling water in the steam and power conversion systems.
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.

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 System Walkdown Program manages the loss of material for external surfaces of steel components.
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.
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	The Periodic Surveillance and Preventive Maintenance Program manages loss of material for steel components internally exposed to condensation through periodic visual inspections.

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	The Periodic Surveillance and Preventive Maintenance Program manages loss of material for steel heat exchanger components exposed to raw water through periodic visual inspections. 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.
3.4.1-32	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 stainless steel and copper alloy components exposed to raw water through periodic visual inspections. 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 System, NUREG-1801 Vol. 1 (Continued)					
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	Consistent with NUREG-1801. The Selective Leaching Program will manage loss of material due to selective leaching for components of copper alloy > 15% zinc. 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.
3.4.1-36	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	Consistent with NUREG-1801. The Selective Leaching Program will manage loss of material due to selective leaching for gray cast iron components exposed to treated water or raw water. There are no gray cast iron components exposed to soil in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
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.
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 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.
3.4.1-41	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.

Table 3.4.1: Steam and Power Conversion System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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.
3.4.1-43	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 exposed to concrete in the steam and power conversion systems.
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 through 3.4.2-5

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. Aging management of the main condenser is not based on analysis of materials, environments and aging effects. Condenser integrity required to perform the post-accident intended function (holdup and plateout of MSIV leakage) is continuously confirmed by normal plant operation. This intended function does not require the condenser to be leak-tight, and the post-accident conditions in the condenser will be essentially atmospheric. Since normal plant operation assures adequate condenser pressure boundary integrity, the post-accident intended function to provide holdup volume and plateout surface is assured. Based on past precedence (NUREG-1796, Dresden and Quad Cities SER, Section 3.4.2.4.4, and NUREG-1769, Peach Bottom SER, Section 3.4.2.3), the staff concluded that main condenser integrity is continually verified during normal plant operation and no aging management program is required to assure the post-accident intended function.

Table 3.4.2-1
Condensate Storage System
Summary of Aging Management Evaluation

Table 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 – outdoor (ext)	Loss of material	System Walkdown	VIII.H-1 (S-32)	3.4.1-22	E
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	System Walkdown			G
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
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	System Walkdown			G
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	Soil	Loss of material	Buried Piping and Tanks Inspection	VIII.E-28 (SP-37)	3.4.1-17	E
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.E-40 (S-13)	3.4.1-6	E

Table 3.4.2-1: Condensate Storage System (Continued)								
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 (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.B1-7 (SP-60)	3.4.1-30	E
Tank	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VIII.E-39 (S-31)	3.4.1-20	E
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
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	System Walkdown			G
Tubing	Pressure boundary	Stainless steel	Soil	Loss of material	Buried Piping and Tanks Inspection	VIII.E-28 (SP-37)	3.4.1-17	E
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VIII.E-23 (SP-27)	3.4.1-36	A
Valve body	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	System Walkdown	VIII.H-8 (S-41)	3.4.1-28	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
Valve body	Pressure boundary	Stainless Steel	Air – outdoor (ext)	Loss of material	System Walkdown			G

Table 3.4.2-1: Condensate Storage System (Continued)								
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	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.4.2-2
Main Condenser and MSIV Leakage Pathway
Summary of Aging Management Evaluation

Table 3.4.2-2: Main Condenser and MSIV Leakage Pathway								
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	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
Bolting	Pressure boundary	Stainless steel	Air—indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Condenser	Plateout	Carbon steel	Air—indoor (ext)	None	None			401
Condenser	Plateout	Carbon steel	Treated water (int)	None	None			401
Condenser	Plateout	Carbon steel	Steam > 270ºF (int)	None	None			401
Condenser	Plateout	Copper alloy	Raw water (ext)	None	None			401
Condenser	Plateout	Copper alloy	Treated water (int)	None	None			401
Condenser	Plateout	Copper alloy	Steam > 270ºF (int)	None	None			401
Condenser (tubes)	Plateout	Titanium	Raw water (int)	None	None			401
Condenser (tubes)	Plateout	Titanium	Treated water (ext)	None	None			401

Table 3.4.2-2: Main Condenser and MSIV Leakage Pathway (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Condenser (tubes)	Plateout	Titanium	Steam > 270ºF (ext)	None	None			401
Expansion joint	Plateout	Elastomer	Air—indoor (ext)	None	None			401
Expansion joint	Plateout	Elastomer	Treated water (int)	None	None			401
Expansion joint	Plateout	Elastomer	Steam > 270ºF (int)	None	None			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 > 270ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C
Orifice	Pressure boundary	Stainless steel	Steam > 270ºF (int)	Cracking -fatigue	TLAA-metal fatigue			H
Orifice	Pressure boundary	Stainless steel	Steam > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C
Piping	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Steam > 270ºF (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Steam > 270ºF (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	A

Table 3.4.2-2: Main Condenser and MSIV Leakage Pathway (Continued)								
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 > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Strainer housing	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Strainer housing	Pressure boundary	Carbon steel	Steam > 270ºF (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Strainer housing	Pressure boundary	Carbon steel	Steam > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Thermowell	Pressure boundary	Carbon steel	Air—indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Thermowell	Pressure boundary	Carbon steel	Steam > 270ºF (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Thermowell	Pressure boundary	Carbon steel	Steam > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
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 > 270ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C
Thermowell	Pressure boundary	Stainless steel	Steam > 270ºF (int)	Cracking-fatigue	TLAA-metal fatigue			H
Thermowell	Pressure boundary	Stainless steel	Steam > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C

Table 3.4.2-2: Main Condenser and MSIV Leakage Pathway (Continued)								
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 > 270ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C
Tubing	Pressure boundary	Stainless steel	Steam > 270ºF (int)	Cracking-fatigue	TLAA-metal fatigue			H
Tubing	Pressure boundary	Stainless steel	Steam > 270ºF (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	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Steam > 270ºF (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Steam > 270ºF (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	A
Valve body	Pressure boundary	Carbon steel	Steam > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
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 > 270ºF (int)	Cracking-fatigue	TLAA-metal fatigue			H
Valve body	Pressure boundary	Stainless Steel	Steam > 270ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.A-11 (SP-45)	3.4.1-13	C

Table 3.4.2-2: Main Condenser and MSIV Leakage Pathway (Continued)								
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 > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-13 (SP-46)	3.4.1-37	C

3.5 STRUCTURES AND COMPONENT SUPPORTS

3.5.1 Introduction

This section provides the results of the aging management review for structural components and commodities that are subject to aging management review. The following structures and commodity groups are addressed in this section (descriptions are available in the referenced sections).

- primary containment (Section 2.4.1)
- reactor building (Section 2.4.2)
- intake structure (Section 2.4.3)
- process facilities (Section 2.4.4)
- yard structures (Section 2.4.5)
- bulk commodities (Section 2.4.6)

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 Primary Containment – Summary of Aging Management Evaluation
- Table 3.5.2-2 Reactor Building – Summary of Aging Management Evaluation
- Table 3.5.2-3 Intake Structure – Summary of Aging Management Evaluation
- Table 3.5.2-4 Process Facilities – Summary of Aging Management Evaluation
- Table 3.5.2-5 Yard Structures – Summary of Aging Management Evaluation
- Table 3.5.2-6 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 Primary Containment

Materials

Primary containment components subject to aging management review are constructed of the following materials.

- alumina-ceramic/bonding resin
- carbon steel
- concrete
- elastomer
- galvanized steel
- lubrite sliding surfaces
- stainless steel

Environment

Primary containment components subject to aging management review are exposed to the following environments.

- exposed to fluid environment
- protected from weather

Aging Effects Requiring Management

The following aging effects associated with primary containment components require management.

- change in material properties
- cracking
- cracking - cyclic loading
- cracking - fatigue
- loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on primary containment components.

- Containment Inservice Inspection CII-IWE
- Containment Leak Rate
- Inservice Inspection (ISI-IWF)
- Structures Monitoring

- Water Chemistry Control – BWR

3.5.2.1.2 Reactor Building

Materials

Reactor building components subject to aging management review are constructed of the following materials.

- aluminum
- carbon steel
- concrete
- concrete block
- stainless steel

Environment

Reactor building 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 components require management.

- cracking
- loss of material

Aging Management Programs

The following aging management programs are credited for managing the aging effects for the reactor building components.

- Fire Protection
- Masonry Wall
- Periodic Surveillance and Preventive Maintenance
- Structures Monitoring
- Water Chemistry Control – BWR

3.5.2.1.3 Intake Structure

Materials

Intake structure components subject to aging management review are constructed of the following materials.

- carbon steel
- copper alloy
- concrete
- concrete block
- galvanized steel

Environment

Intake structure 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 intake structure components require management.

- change in material properties
- cracking
- loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on intake structure components.

- Fire Protection
- Masonry Wall
- Structures Monitoring

3.5.2.1.4 Process Facilities

Materials

Process facilities components subject to aging management review are constructed of the following materials.

- carbon steel
- concrete
- concrete block
- galvanized steel

Environment

Process facilities 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 process facilities components require management.

- cracking
- loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on process facilities components.

- Fire Protection
- Masonry Wall
- Periodic Surveillance and Preventive Maintenance
- Structures Monitoring

3.5.2.1.5 Yard Structures

Materials

Yard structures components subject to aging management review are constructed of the following materials.

- carbon steel
- concrete
- rip rap and capstone

Environment

Yard 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 yard structures components require management.

- change in material properties
- cracking
- loss of form
- loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on yard structures components.

- Structures Monitoring
- Water Control Structures Monitoring

3.5.2.1.6 Bulk Commodities

Materials

Bulk commodities subject to aging management review are constructed of the following materials.

- aluminum

- carbon steel
- ceramic fiber filler
- concrete
- elastomer/rubber, silicone, PVC
- fiberglass/calcium silicate
- galvanized steel
- marinite board, flamastic, kaowool, cera blanket
- pyrocrete, duraspray, grout
- 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

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on bulk commodities.

- Fire Protection
- Inservice Inspection (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 and other issues that require further evaluation. The following sections, numbered in accordance with the corresponding discussions in NUREG-1800, explain the PNPS 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

PNPS 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

PNPS 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 air content between 3% and 6% and a water/cement ratio between 0.44 and 0.60. 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

PNPS does not rely on a dewatering system for control of settlement. Structures are founded on dense to very dense silty sand and sand and gravel above the rock subgrade. PNPS containment was not identified in IN 97-11 as a plant susceptible to erosion of porous concrete subfoundations. Additionally, groundwater in-leakage is minimized by a waterproof membrane. This membrane protects the reactor building concrete against exposure to groundwater. Groundwater was not aggressive during plant construction and no changes in groundwater conditions have been observed at PNPS.

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 applicable to PNPS concrete structures.

3.5.2.2.1.3 Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature

ASME Code, Section III, Division 2, Subsection CC indicates that aging due to elevated temperature exposure is not significant as long as concrete general area temperatures do not exceed 150°F and local area temperatures do not exceed 200°F. During normal operation, areas within primary containment are within these temperature limits. Therefore, reduction of strength and modulus of concrete structures due to elevated temperature is not an aging effect requiring management for PNPS containment concrete.

3.5.2.2.1.4 Loss of Material Due to General, Pitting and Crevice Corrosion

PNPS containment is a Mark I steel containment located within the reactor building. PNPS 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 (CII) (IWE) Program and Structures Monitoring Program.

The PNPS drywell concrete floor was chipped out at several locations to expose the drywell shell below floor level and no evidence of corrosion was found. UT examinations of the drywell shell indicated no significant wall reduction. 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 8 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

PNPS 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 is not an applicable aging effect.

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 of the application. Fatigue TLAAs for the steel drywell, torus, and associated penetrations are evaluated as documented in Section 4.6.

3.5.2.2.1.7 Cracking Due to Stress Corrosion Cracking (SCC)

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 PNPS are penetration sleeves and bellows.

Stress corrosion cracking becomes significant for stainless steel if tensile stresses and a corrosive environment exist. The stresses may be applied (external) or residual (internal). The normal environment inside the drywell is dry. The penetration components are not exposed to corrosive environments. Therefore, stress corrosion cracking is not an aging effect requiring management for the penetration sleeves and bellows, since the conditions necessary for SCC do not exist.

3.5.2.2.1.8 Cracking Due to Cyclic Loading

Cyclic loading can lead to cracking of penetration sleeves, penetration bellows, and torus pool steel. If a CLB analysis does not exist, further evaluation is recommended of inspection methods to detect cracking due to cyclic loading since visual VT-3 examinations may be unable to detect this aging effect.

The analysis of cracking due to cyclic loading of the drywell, torus, and associated penetrations is a TLAA which is evaluated as documented in Section 4.6.

3.5.2.2.1.9 Loss of Material (Scaling, Cracking, and Spalling) Due to Freeze-Thaw

PNPS 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. 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

PNPS has a Mark I free-standing steel containment located within the reactor building. In accordance with NUREG-1801, aging management is not required because PNPS 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

3.5.2.2.2.1 Aging of Structures Not Covered by Structures Monitoring Program

PNPS concrete structures subject to aging management review are included in the Structures Monitoring Program. 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 PNPS 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 (between 0.44 and 0.60), proper curing and adequate air content between 3 percent and 6 percent. Therefore, cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not aging effects requiring management for PNPS 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 PNPS use a dense low permeable concrete with a maximum water-to-cement ratio of 0.48, 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. PNPS concrete is constructed in accordance with the recommendations in ACI 201.2R-77 for durability.

PNPS 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 PNPS Groups 1-5, 7, 9 concrete structures.

3. Loss of Material Due to Corrosion for Groups 1-5, 7, 8 Structures

   PNPS Structures Monitoring Program will be used to manage aging effect requiring management for PNPS 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. PNPS 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 PNPS 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. PNPS 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 1-3, 5, 7-9 structures is not an aging effect requiring management for PNPS concrete.

6. Cracks and Distortion Due to Increased Stress Levels from Settlement for Groups 1-3, 5-9 Structures

Groups 1-3, 5-9 structures at PNPS are founded on dense to very dense silty sand and sand and gravel. No significant settlement has occurred since construction and additional settlement is not anticipated. Therefore, cracks and distortion due to increased stress levels from settlement for Groups 1-3, 5-9 structures is not an aging mechanism for PNPS concrete.

7. Reduction in Foundation Strength, Cracking, Differential Settlement Due to Erosion of Porous Concrete Subfoundation for Groups 1-3, 5-9 Structures

   PNPS structures are not constructed of porous concrete. Concrete was provided in accordance with ACI 318-63 requirements resulting in dense, well-cured, high-strength concrete with low-permeability. Therefore, reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation are not aging effects requiring management for PNPS 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 PNPS. However, Lubrite® plates are included within the Structures Monitoring Program and Inservice Inspection (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

PNPS 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

PNPS 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. PNPS 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 PNPS concrete.

3.5.2.2.2.3 Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature

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 PNPS.

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 PNPS 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 an aging effect requiring management for below-grade inaccessible concrete areas of PNPS 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. PNPS 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 is not aging effects requiring management for PNPS Groups 6 structures below-grade and not continuously exposed to raw water.

For Group 6 concrete that is continuously exposed to raw water of the Cape Cod Bay that may become saturated, it is conservatively considered susceptible to freeze-thaw and managed by the Structures Monitoring Program.

3. Cracking Due to Stress Corrosion Cracking (SCC), 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. PNPS 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. PNPS 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 mechanism for PNPS 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 Structure Monitoring Program. Component supports at PNPS 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

PNPS concrete anchors and surrounding concrete are included in the Structures Monitoring Program (Groups B2 through B5) and Inservice Inspection (ISI-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 PNPS. 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 PNPS 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 PNPS 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 PNPS 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 RPV and drywell bellows, drywell to torus ventline bellows, drywell to torus vent system, torus shell, primary containment and torus penetrations. 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 the following tables and Section 3.5.2.1. 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. PNPS 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**
3.5.1-2	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. PNPS 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.

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. PNPS containment is a Mark I steel containment.
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. PNPS 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**
3.5.1-5	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 PNPS. 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 any contact with the atmosphere by complete concrete encasement. Concrete is designed in accordance with ACI standards and monitored for cracks under the Structures Monitoring Program. (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**
					The drywell steel where the drywell shell is embedded is inspected in accordance with the Containment Inservice Inspection (CII) 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. PNPS containment is a Mark I steel containment.
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. PNPS 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**
3.5.1-8	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	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	Not applicable. See Section 3.5.2.2.1.
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	Not applicable. See Section 3.5.2.2.1.7.

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**
3.5.1-11	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	Not applicable. See Section 3.5.2.2.1.7.
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 and Containment Leak Rate Program will manage this aging effect. The Containment Inservice Inspection (CII) Program includes augmented ultrasonic exams to detect fine cracks.
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 and Containment Leak Rate Program will manage this aging effect. The Containment Inservice Inspection (CII) 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**
3.5.1-14	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. PNPS containment is a Mark I steel containment.
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. PNPS 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**
3.5.1-16	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 PNPS, the Containment Leak Rate test manages cracking and change in material properties. Containment Inservice Inspection (CII) is a plant-specific program for PNPS. Seals and gaskets are not included in the Containment Inservice Inspection (CII) Program at PNPS.
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 PNPS 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 Program will manage this aging effect. Containment inservice inspection is a plant-specific program for PNPS.
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 PNPS 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. PNPS containment is a Mark I steel containment.
3.5.1-21	Steel elements: drywell head and downcomer pipes	Fretting or lock up due to mechanical wear	ISI (IWE)	No	PNPS plant operating experience has not identified fretting or lock up due to mechanical wear for the drywell head and downcomers.

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**
3.5.1-22	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion	ISI (IWL)	No	Not applicable. PNPS containment is a Mark I steel containment without prestressed tendons.
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 PNPS prevents corrosion of embedded steel. See Section 3.5.2.2.2.1(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 PNPS. See Section 3.5.2.2.2.1 (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 mange the effects of aging. In some cases Structures Monitoring Program is supplemented by periodic surveillance and preventive maintenance and Fire Protection 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 PNPS. See Section 3.5.2.2.2.1(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 PNPS. See Section 3.5.2.2.2.1(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	PNPS structures are founded on compacted sand subgrade associated with bedrock. Plant operating experience has not identified settlement of structures resulting in cracks and distortion of component structures; therefore aging management is not required. See discussion in Section 3.5.2.2.2.1(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**
3.5.1-29	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	PNPS structures are founded on compacted sand subgrade associated with bedrock. Plant operating experience has not identified settlement of structures resulting is cracks and distortion of component structures; therefore aging management is not required. See discussion in Section 3.5.2.2.2.1(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 PNPS. 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	PNPS 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 PNPS 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(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	PNPS 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 PNPS prevents the effect of this aging from occurring; therefore, this aging effect does not require management. See Section 3.5.2.2.2.1 (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	PNPS 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 PNPS 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 PNPS Group 6 components exposed to a fluid 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**
3.5.1-35	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 PNPS is designed with entrained air content of between 4% and 6% in conformance with ACI-301, 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 PNPS 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**
3.5.1-36	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 PNPS concrete components. See Section 3.5.2.2.2.1(5) for additional discussion. Nonetheles, the Structures Monitoring Program will confirm the absence of aging effects requiring management for PNPS 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	This aging effect is managed by the Structures Monitoring Program or Group 6 concrete components. This aging effect is considered change in material properties.
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 PNPS license renewal
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	Consistent with NUREG-1801. Structures Monitoring Program will manage aging effects identified by this line item.

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**
3.5.1-40	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	PNPS concrete components subject to this aging effect are insignificant. 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 PNPS concrete components.
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 PNPS 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.

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**
3.5.1-43	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. The Masonry Wall Program manages this aging effect. In some cases the Masonry Wall Program is supplemented by Fire Protection Program.
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: moisture barrier, compressible joints and seals used for seismic gaps, and fire barrier seals. The Structures Monitoring Program manages cracking and change in material properties.

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**
3.5.1-45	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 PNPS due to the low flow velocities for these structures. Nonetheless, the Structures Monitoring Program will confirm absence of aging effects requiring management for PNPS 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 PNPS, the Water Chemistry Control – BWR Program manages aging effects on the spent fuel pool liner. Monitoring spent fuel pool water level in accordance with technical specifications and monitoring leakage from the leak 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 at less than 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 PNPS Group 6 steel components.
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	The listed aging management program is not used. The plant-specific water control Structures Monitoring Program will manage the effects of aging for PNPS Group 6 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	This aging effect is managed by the PNPS Water Chemistry Control – BWR Program and ISI-IWF Program
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	Not applicable. Due to absence of environment in PNPS, loss of material is not an aging effect requiring management.

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 PNPS since 1) high strength bolting at PNPS is not exposed to a corrosive environment or high tensile stresses, and 2) high strength structural bolts are installed via the turn-of-the-nut method, contact surfaces and joints are “Friction Type” as defined by AISC; therefore, for bolts greater than 1" in diameter, a significant preload (in the order of 70% of ultimate strength) is not practical to develop. Loss of material at PNPS is managed in accordance with the PNPS ISI-IWF 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**
3.5.1-52	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. Proper design prevents distortion, overload, and fatigue due to vibratory and cyclic thermal loads.
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	This aging effect is managed by the PNPS ISI-IWF Program.
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. Proper design prevents distortion, overload, and fatigue due to vibratory and cyclic thermal loads.
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 PNPS. 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 PNPS 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 PNPS.

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 3.5.2-6

Generic notes

A. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP 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 environment is not conducive to the aging effects in NUREG-1801. 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 PNPS.

Table 3.5.2-1
Primary Containment
Summary of Aging Management Evaluation

Table 3.5.2-1: Primary Containment								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bellows (reactor vessel and drywell)	PB, SSR	Stainless Steel	Protected from weather	Cracking –cyclic loading	CII-IWE Containment Leak Rate	II.B1.1-3 (C-20)	3.5.1-13	C
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 head	EN, FLB, 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	EN, FLB, 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 sump screen	SSR	Galvanized Steel	Protected from weather	None	None	III.B1.1-7 (TP-11)	3.5.1-58	A
Drywell to torus vent line bellows	PB, SSR	Stainless Steel	Protected from weather	Cracking – cyclic loading	CII-IWE Containment Leak Rate	II.B1.1-3 (C-20)	3.5.1-13	E

Table 3.5.2-1: Primary Containment (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
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	Protected from weather	Cracking - fatigue	TLAA-metal fatigue	II.B1.1-4 (C-21)	3.5.1-8	A
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
Jet deflectors	MB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	E
Personnel airlock	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
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 mechanical penetrations (includes those w/ bellows)	PB, SSR	Carbon steel	Protected from weather	Cracking	CII-IWE Containment Leak Rate	II.B4-3 (C-14)	3.5.1-12	E

Table 3.5.2-1: Primary Containment (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
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
Reactor vessel stabilizer supports	SSR	Carbon steel	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Sacrificial shield wall lateral supports	SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	C
Sacrificial 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	C
Structural steel: plates, columns and beams	SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	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 (columns, saddles)	SSR	Carbon steel	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Torus manway	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

Table 3.5.2-1: Primary Containment (Continued)

Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Torus ring girders	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 ring girders	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	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 shell	HS, PB, SSR	Carbon steel	Protected from weather	Cracking - fatigue	TLAA-metal fatigue	II.B1.1-4 (C-21)	3.5.1-8	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	II.B1.1-13 (T-24)	3.5.1-53	E
Drywell sump	FLB, SSR	Concrete	Exposed to fluid environment	None	Structures Monitoring			I, 501

Table 3.5.2-1: Primary Containment (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Equipment hatch concrete plug	EN, MB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Floor slabs, walls	EN, FLB, MB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Floor slabs, walls (EQ Zone 1.30, Drywell El. 9'-2")	EN, FLB, MB, SSR	Concrete	Protected from weather	Cracking Change in material properties	Structures Monitoring			H
Foundation	EN, FLB, MB, PB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Reactor vessel support pedestal	SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Sacrificial shield wall (concrete portion)	EN, MB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Primary containment electrical penetration seals and sealant	PB, SSR	Elastomer	Protected from weather	Cracking Change in material properties	Containment Leak Rate	II.B.4-7 (C-18)	3.5.1-16	E

Table 3.5.2-1: Primary Containment (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Primary containment electrical penetration seals and sealant	PB, SSR	Alumina-ceramic/ Bondng resin	Protected from weather	None	None			F
Lubrite sliding supports	SSR	Lubrite	Protected from weather	None	ISI-IWF Structures Monitoring			I, 501

Table 3.5.2-2
Reactor Building
Summary of Aging Management Evaluation

Table 3.5.2-2: Reactor Building								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Blowout or blow-off panels	EN, PB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 (T-11)	3.5.1-25	C
Blowout or blow-off panels	EN, PB, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A1-12 (T-11)	3.5.1-25	C
Equipment lock	EN, FB, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring Fire Protection	III.A1-12 (T-11)	3.5.1-25	C
Metal partition walls	EN, FB	Carbon steel	Protected from weather	Loss of material	Structures Monitoring Fire Protection	III.A1-12 (T-11)	3.5.1-25	C
Metal siding	EN, PB	Aluminum	Exposed to weather	None	None			F
New fuel storage racks	EN, SSR	Stainless steel	Protected from weather	None	None	III.B1.3-7 (TP-5)	3.5.1-59	C
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

Table 3.5.2-2: Reactor Building (Continued)

Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Refueling platform	SNS	Carbon steel	Protected from weather	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.B-3 (A-07)	3.3.1-73	E
Roof framing and insulated metal decking	EN, SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 (T-11)	3.5.1-25	C
Spent fuel pool liner plate and gates	EN, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR Monitoring of spent fuel pool level per Tech Spec and monitoring leakage from the leak chase channel	III.A5-13 (T-14)	3.5.1-46	C
Spent fuel pool storage racks	SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR			H
Structural steel: beams, columns, plates, trusses	EN, MB, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 (T-11)	3.5.1-25	C
Beams, columns, floor slabs, interior walls	EN, FB, FLB, MB, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501

Table 3.5.2-2: Reactor Building (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Biological shield wall	EN, MB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Exterior walls	EN, FB, FLB, MB, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring Fire Protection			I, 501
Foundations	FLB, PB, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Masonry walls	EN, FB, MB. SNS, SSR	Concrete block	Protected from weather	Cracking	Masonry Wall Fire Protection	III.A1-11 (T-12)	3.5.1-43	A
New fuel storage vault	EN, MB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Spent fuel pool bottom slab, and walls	EN, MB, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Sump	SSR	Concrete	Exposed to fluid environment	None	Structures Monitoring			I, 501
Water trough	PB, SNS, SSR	Concrete block	Protected from weather	Cracking	Masonry Wall	III.A1-11 (T-112)	3.5.1-43	C
Water trough	PB, SNS, SSR	Concrete block	Exposed to fluid environment	Cracking	Masonry Wall	III.A1-11 (T-112)	3.5.1-43	C

Table 3.5.2-3
Intake Structure
Summary of Aging Management Evaluation

Table 3.5.2-3: Intake Structure								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Baseplates, fasteners and supports	EN, SNS	Copper alloy (monel)	Protected from weather	None	None			F
Baseplates, fasteners and supports	EN, SNS	Copper alloy (monel)	Exposed to fluid environment	Loss of material	Structures Monitoring			F
Metal roof decking	EN, SNS	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
Structural steel: beams, columns, plates	EN, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Structural steel: beams, columns, plates	EN, SNS, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Structural steel: beams, columns, plates	EN, SNS, SSR	Galvanized steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Beams, columns, floor slabs, interior walls	EN, FB, FLB, MB, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501

Table 3.5.2-3: Intake Structure (Continued)

Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Beams, columns, floor slabs, interior walls	EN, FLB, MB, SNS, SSR	Concrete	Exposed to fluid environment	Loss of material Cracking	Structures Monitoring	III.A6-1 (T-18)	3.5.1-34	E
				Change in material properties		III.A6-6 (T-16)	3.5.1-37	
Exterior walls	EN, FB, FLB, MB, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring Fire Protection			I, 501
Foundations	EN, SNS, SSR	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.A6-10 (T-12)	3.5.1-43	A
Pump bays	EN, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Pump bays	EN, SNS, SSR	Concrete	Exposed to fluid environment	Loss of material Cracking	Structures Monitoring	III.A6-1 (T-18)	3.5.1-34	E
				Change in material properties		III.A6-6 (T-16)	3.5.1-37	
Roof slabs	EN, FB, MB, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring Fire Protection			I, 501

Table 3.5.2-3: Intake Structure (Continued)

Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Skimmer wall	EN, SNS, SSR	Concrete	Exposed to fluid environment	Loss of material Cracking	Structures Monitoring	III.A6-1 (T-18)	3.5.1-34	E
				Change in material properties		III.A6-6 (T-16)	3.5.1-37	
Skimmer wall	EN, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Skimmer wall	EN, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Sump	SNS	Concrete	Exposed to fluid environment	None	Structures Monitoring			I, 501

Table 3.5.2-4
Process Facilities
Summary of Aging Management Evaluation

Table 3.5.2-4: Process Facilities								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Blowout or blow-off panels	EN, PB, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Control room ceiling support system	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
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
Main stack	EN, SNS, SSR	Carbon steel	Exposed to weather	Loss of material	Periodic Surveillance and Preventive Maintenance	III.A3-12 (T-11)	3.5.1-25	E
Main stack guy wires	SNS, SSR	Galvanized steel	Exposed to weather	Loss of material	Periodic Surveillance and Preventive Maintenance	III.A3-12 (T-11)	3.5.1-25	E
Metal partition walls	EN, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Roof framing and insulated metal decking	EN, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	C

Table 3.5.2-4: Process Facilities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Structural steel: beams, columns, plates	EN, 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
Beams, columns, floor slabs, interior walls	EN, FB, FLB, MB, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501
Exterior walls	EN, FB, FLB, MB, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring Fire Protection			I, 501
Foundations	FLB, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Interior walls (control room envelope)	EN, FB, PB, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501
Main stack chimney	EN, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Main stack chimney	EN, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Main stack guy wire deadman	SNS, SSR	Concrete	Exposed to weather	None	Periodic Surveillance and Preventive Maintenance			I, 501

Table 3.5.2-4: Process Facilities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Masonry walls	EN, FB, MB, SNS, SRE, SSR	Concrete block	Protected from weather	Cracking	Masonry Wall Fire Protection	III.A3-11 (T-12)	3.5.1-43	A
Roof slabs	EN, FB, FLB, MB, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring Fire Protection			I, 501
Shield walls and plugs	EN	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Sumps	SNS, SSR	Concrete	Exposed to fluid environment	None	Structures Monitoring			I, 501

Table 3.5.2-5
Yard Structures
Summary of Aging Management Evaluation

Table 3.5.2-5: Yard Structures								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
SBO diesel generator enclosure	EN, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
SBO diesel generator enclosure	EN, SRE	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Security diesel generator building	EN, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Security diesel generator building	EN, SRE	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Structural steel: beams, columns, plates, trusses	EN, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	A
Structural steel: beams, columns, plates, trusses	EN, SRE	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	A
Switchyard relay house	EN, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Beams, columns, floor slabs, interior walls	EN, SRE	Concrete	Protected from weather	None	Structures Monitoring			I, 501

Table 3.5.2-5: Yard Structures (Continued)

Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Discharge structure	EN, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Discharge structure	EN, SNS, SSR	Concrete	Exposed to fluid environment	Loss of material Cracking	Structures Monitoring	III.A6-1 (T-18)	3.5.1-34	E
				Change in material properties		III.A6-6 (T-16)	3.5.1-37	
Duct banks	EN	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Exterior walls	EN, SRE	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Foundations (switchyard relay house, tanks, SBO diesel generator, security diesel generator building, transformers)	SNS, SRE, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Manholes	EN	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Sumps	SNS	Concrete	Exposed to fluid environment	None	Structures Monitoring			I, 501
Trenches	EN, FLB, MB, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501

Table 3.5.2-5: Yard Structures (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve pits	EN, SRE	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Breakwaters, jetties and revetments	EN, FLB, SNS	Rip raps and capstone	Exposed to weather	Loss of material Loss of form	Water Control Structures Monitoring	III.A6-9 (T-22)	3.5.1-48	E
Breakwaters, jetties and revetments	EN, FLB, SNS	Rip raps and capstone	Exposed to fluid environment	Loss of material Loss of form	Water Control Structures Monitoring	III.A6-9 (T-22)	3.5.1-48	E

Table 3.5.2-6
Bulk Commodities
Summary of Aging Management Evaluation

Table 3.5.2-6: Bulk Commodities								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**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
					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
					ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
					Water Chemistry Control – BWR ISI-IWF	III.B1.1-11 (TP-10)	3.5.1-49	E
Anchorage / embedments	SNS, SRE, SSR	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
					ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
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
					ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Battery racks	SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B3-7 (T-30)	3.5.1-39	C
Cable tray	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	C
Cable tray	SNS, SRE, SSR	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

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
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.B 1.3-7 (TP-5)	3.5.1-59	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
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
Conduit	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Conduit	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
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

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
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
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.B2-10 (T-30)	3.5.1-39	A
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	EN, 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	EN, 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	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B3-3 (TP-11)	3.5.1-58	A
Electrical and Instrument panels and enclosures	EN, SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	C
Fire doors	FB	Carbon steel	Protected from weather	Loss of material	Fire Protection	VII.G-3 (A-21)	3.3.1-63	C

Table 3.5.2-6: Bulk Commodities (Continued)

Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fire doors	FB	Carbon steel	Exposed to weather	Loss of material	Fire Protection	VII.G-4 (A-21)	3.3.1-63	C
Fire hose reels	SRE	Carbon steel	Protected from weather	Loss of material	Fire Protection	III.B2-10 (T-30)	3.5.1-39	E
Flood curbs	EN, FLB	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
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
						III.A6-11 (T-21)	3.5.1-47	E
Flood, pressure and specialty doors	EN, FLB, MB, 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	A
						III.A6-11 (T-21)	3.5.1-47	E
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

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
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.B 3-7 (T-30)	3.5.1-39	A
Instrument racks, frames, and tubing trays	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring	III.B 3-7 (T-30)	3.5.1-39	A
Manway hatches and hatch covers	EN, FLB, MB, PB, SNS, SRE, SSR	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
						III.A6-11 (T-21)	3.5.1-47	E
Manway hatches and hatch covers	EN, FLB, PB, MB, SNS, SRE, SSR	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
						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

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
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 primary containment structure boundary)	FLB, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	C
Pipe whip restraints	EN, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A
Stairways, handrails, platforms, gratings, decking, and ladders	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A
Stairways, handrails, platforms, gratings, 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	Aluminum	Exposed to weather	Loss of material	Structures Monitoring	III.B2-7 (TP-6)	3.5.1-50	C
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

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
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
Anchor bolts	SNS, SRE, SSR	Carbon steel (threaded fasteners)	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 (threaded fasteners)	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
Anchor bolts	SNS, SRE, SSR	Carbon steel (threaded fasteners	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	SNS, SRE, SSR	Carbon steel (threaded fasteners	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

Table 3.5.2-6: Bulk Commodities (Continued)

Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Anchor bolts	SNS, SRE, SSR	Galvanized steel (threaded fasteners)	Protected from weather	None	None	III.B2-5 III.B3-3 III.B4-5 III.B5-3 (TP-11)	3.5.1-58	A
Anchor bolts	SNS, SRE, SSR	Galvanized steel (threaded fasteners)	Exposed to weather	Loss of material	Structures Monitoring	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	A
Anchor bolts	SNS, SRE, SSR	Stainless steel (threaded fasteners)	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 support s bolting	SNS, SRE, SSR	Carbon steel (threaded fasteners)	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	SNS, SRE, SSR	Carbon steel (threaded fasteners)	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

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
ASME Class 1, 2, 3 and MC supports bolting	SNS, SRE, SSR	Stainless steel (threaded fasteners)	Protected from weather	None	None	III.B1.1-9 III.B1.2-7 III.B1.3-7 (TP-5)	3.5.1-59	A
Structural bolting	SSR, SNS, SRE	Carbon steel (threaded fasteners)	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	SSR, SNS, SRE	Carbon steel (threaded fasteners)	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	SSR, SNS, SRE	Galvanized steel (threaded fasteners)	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	SSR, SNS, SRE	Galvanized steel (threaded fasteners)	Exposed to weather	Loss of material	Structures Monitoring	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	A

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Structural bolting	SSR, SNS, SRE	Carbon steel (threaded fasteners)	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Structural bolting	SNS, SRE, SSR	Stainless steel (threaded fasteners)	Exposed to weather	Loss of material	Structures Monitoring	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	A
Structural bolting	SNS, SRE, SSR	Stainless steel (threaded fasteners)	Protected from weather	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5 (TP-5)	3.5.1-59	A
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, duraspray, grout	Protected from weather	None	Structures Monitoring Fire Protection			I, 501
Flood curbs	FLB	Concrete	Protected from weather	None	Structures Monitoring			I, 501

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Manway hatches and hatch covers	EN, FB, FLB, MB, PB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501
Manway hatches and hatch covers	EN, FB, FLB, MB, 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
Missile shields	MB	Concrete	Exposed to 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 Cracking	Structures Monitoring	III.A6-1 (T-18)	3.5.1-34	E
				Change in material properties		III.A6-6 (T-16)	3.5.1-37	

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Building pressure boundary sealant	PB	Elastomer	Protected from weather	Cracking Change in material properties	Structures Monitoring			J
Compressible joints and seals	SNS	Elastomer	Protected from weather	Cracking Change in material properties	Structures Monitoring			J
Fire stops	FB, PB	Silicone elastomer, cera blanket	Protected from weather	Cracking / delamination Separation	Fire Protection			J
Fire wraps	FB	marinite board, flamemastic kaowool, cera blanket	Protected from weather	Loss of material	Fire Protection			J
Insulation	INS, SNS	Fiberglass/ calcium silicate	Protected from weather	None	None			J, 502
Penetration sealant (fire rated, flood, radiation)	EN, FB, FLB, PB, SNS	Elastomer	Protected from weather	Cracking Change in material properties	Structures Monitoring Fire Protection	VII.G-1 (A-19)	3.3.1-61	C

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Seals and gaskets (doors, hatches and manways)	FLB, PB, SSR	Rubber	Protectd from weather	Cracking Change in material properties	Structures Monitoring	II.B4-7 (C-18)	3.5.1-16	E
						III.A6-12 (TP-7)	3.5.1-44	
Seismic joint filler	FB, SNS	Elastomer	Protected from weather	Cracking Change in material properties	Structures Monitoring Fire Protection	VII.G-1 (A-19)	3.3.1-61	C
Water stops	FLB	PVC	Exposed to weather	None	None			J

3.6 ELECTRICAL AND INSTRUMENTATION AND CONTROLS

3.6.1 Introduction

This section provides the results of the aging management reviews for electrical components that are subject to aging management review. Consistent with the methods described in NEI 95-10, the electrical and I&C aging management reviews focus on commodity groups rather than systems. The following electrical commodity groups requiring aging management review are addressed in this section.

- high voltage insulators
- insulated cables and connections
- phase bus
- switchyard bus

Table 3.6.1, Summary of Aging Management Programs for the Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the electrical and I&C components. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.6.2 Results

Table 3.6.2-1, Electrical and I&C Components—Summary of Aging Management Evaluation, summarizes the results of aging management reviews and the NUREG-1801 comparison for the electrical and I&C components.

3.6.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for electrical and I&C components subject to aging management review. Programs are described in Appendix B. Further details are provided in Table 3.6.2-1.

Materials

Electrical and I&C components are constructed of the following materials.

- aluminum
- copper and copper alloys
- galvanized metals
- organic polymers
- porcelain
- steel and steel alloys

Environment

Electrical and I&C components are exposed to the following environments.

- heat and air
- moisture and voltage stress
- 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 manage the effects of aging on electrical and I&C components.

- Metal-Enclosed Bus Inspection
- Non-EQ Inaccessible Medium-Voltage Cable
- Non-EQ Instrumentation Circuits Test Review
- Non-EQ Insulated Cables and Connections

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 in accordance with the discussions in NUREG-1800, explain the PNPS approach to these areas requiring further evaluation. Programs are described in Appendix B.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

Environmental qualification analyses are TLAAs as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). The evaluation of TLAAs is addressed in Section 4.4 of this application.

3.6.2.2.2 Degradation of Insulator Quality due to Presence of Any Salt Deposits and Surface Contamination, and Loss of Material due to Mechanical Wear

The discussion in NUREG-1800 concerns effects of these aging mechanisms on high voltage insulators.

High voltage insulators supporting conductors that provide recovery of offsite power following SBO include those associated with the switchyard bus located between switchyard breakers 352-2 / 352-3 and startup transformer X4. High voltage insulators associated with this path are subject to aging management review.

Various airborne materials such as dust, salt and industrial effluents can contaminate insulator surfaces. The buildup of surface contamination in most areas is washed away by rain. The glazed and coated 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. PNPS is located near the seacoast where salt spray is considered. However, salt spray buildup is a short-term concern based on local weather conditions (event-driven). Under conducive weather conditions, salt buildup occurs in a matter of hours or days. Therefore, surface contamination is not an applicable aging mechanism for high-voltage insulators at PNPS.

Mechanical wear is an aging effect for strain and suspension insulators in that they are subject to movement. Wear has not been apparent during routine inspections. If left unmanaged for the period of extended operation surface rust would not cause a loss of intended function and thus, is not a significant concern. Loss of material due to wear will not cause a loss of intended function of the insulators. Therefore, loss of material is not an aging effect requiring management for insulators.

There are no aging effects requiring management for 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. However, PNPS does not utilize transmission conductors in the circuits for recovery of offsite power following an SBO. Other transmission conductors are not subject to aging management review since they do not perform a license renewal intended function.

Switchyard bus is uninsulated, un-enclosed, rigid electrical conductors used in medium and high voltage applications. Switchyard bus includes the hardware used to secure the bus to high-voltage insulators. Switchyard bus establishes electrical connections to disconnect switches, switchyard breakers, and transformers to support recovery of offsite power following SBO.

Connection surface oxidation for aluminum switchyard bus is not applicable since switchyard bus connections requiring AMR are welded connections. For ambient environmental conditions at PNPS, 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 aluminum 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 PNPS quality assurance procedures and administrative controls for aging management programs.

3.6.2.3 Time-Limited Aging Analysis

The only TLAAs identified for electrical and I&C components are evaluations for environmental qualification (EQ). This is evaluated in Section 4.4 of this application.

3.6.3 Conclusion

Electrical and I&C components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21. The aging management programs selected to manage aging effects for electrical and I&C components are identified in the following table and Section 3.6.2.1. A description of 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 on 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 it is replaced 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 Instrumentation Circuits Test Review Program will manage the effects of aging. This program includes inspection of non-EQ electrical and I&C penetration cables and connections.

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 and surveillance testing results of 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	Consistent with NUREG-1801. The Non-EQ Inaccessible Medium-Voltage Cable Program will manage the effects of aging. This program includes inspection of medium-voltage cables exposed to significant moisture and voltage and testing as required.
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 effect is not applicable to Pilgrim. A review of PNPS 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 PNPS 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 Pilgrim. 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 Pilgrim. 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 Pilgrim. Cable connections outside of active devices are taped or sleeved for protection. Operating experience with metallic parts of electrical cable connections at PNPS 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								
Component Type	**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)	CE	Various metals used for electrical connections	Indoor and outdoor air	None	None			I
Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements (includes electrical penetration conductors and connections)	CE	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	CE	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

Component Type	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)	IN	Insulation material – various organic polymers	Indoor air	None	None	VI.A-7 (LP-02)	3.6.1-14	A
High voltage insulators (for SBO)	IN	Porcelain, galvanized metal, cement	Outdoor weather	None	None			I
Inaccessible medium-voltage (4.16kV to 22kV) cables (e.g., installed underground in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	CE	Insulation material – various organic polymers	Moisture and voltage stress	Reduced insulation resistance (IR)	Non-EQ Inaccessible Medium-Voltage Cable	VI.A-4 (L-03)	3.6.1-4	A
Metal enclosed bus (non-segregated bus for SBO), connections	CE	Aluminum, copper, steel	Heat and air	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	IN	Porcelain, galvanized iron, or steel	Heat and air	Loss of material	Metal-Enclosed Bus Inspection	VI.A-14 (LP-05)	3.6.1-8	A

Table 3.6.2-1: Electrical Components								
Component Type	**Component Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Metal enclosed bus - enclosure assemblies	SRE	Steel	Heat and air	Loss of material	Metal-Enclosed Bus Inspection	VI.A-13 (LP-06)	3.6.1-9	E
Metal enclosed bus - enclosure assemblies	SRE	Elastomers	Heat and air	Elastomer degradation	Metal-Enclosed Bus Inspection	VI.A-12 (LP-10)	3.6.1-10	E
Switchyard bus (switchyard bus for SBO), connections	CE	Aluminum, copper	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.

4.1.1 Identification of TLAA

The process used to identify the time-limited aging analyses is consistent with the guidance provided in NEI 95-10, *Industry Guidelines for Implementing the Requirements of 10 CFR 54 - The License Renewal Rule*, Revision 6, June 2005. Calculations and analyses that could potentially meet the definition of 10 CFR 54.3 were identified by searching CLB documents including the following.

- Technical Specifications
- UFSAR
- docketed licensing correspondence
- Fire Protection Program documents
- NRC safety evaluation reports
- BWRVIP documents

Industry documents that list generic time-limited aging analyses were also reviewed to provide additional assurance of the completeness of the plant-specific list. These documents included NEI 95-10; NUREG-1800, *Standard Review Plan (SRP) for Review for License Renewal Applications for Nuclear Power Plants*, Revision 1, September 2005; NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 1, September 2005; and NRC safety evaluation reports related to license renewal applications by other BWR licensees.

Table 4.1-1 provides a summary listing of the TLAAs.

4.1.2 Identification of Exemptions

A review of docketed correspondence identified PNPS exemptions. No PNPS exemptions are based on time-limited aging analyses.

Table 4.1-1
List of PNPS TLAA and Resolution

TLAA Description	Resolution Option	Section
Reactor Vessel Neutron Embrittlement Analyses		4.2
Pressure/temperature limits	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.2.2
Charpy upper-shelf energy	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.3
Adjusted reference temperature	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.4
Reactor vessel circumferential weld inspection relief	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.5
Reactor vessel axial weld failure probability	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.6
Metal Fatigue Analyses		4.3
Class 1 fatigue	Analyses remain valid 10 CFR 54.21(c)(1)(i) OR Analysis projected 10 CFR 54.21(c)(1)(ii) OR Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.1
Non-Class 1 fatigue	Analyses remain valid 10 CFR 54.21(c)(1)(i)	4.3.2
Effects of reactor water environment on fatigue life	Analyses remain valid 10 CFR 54.21(c)(1)(i) OR Analysis projected 10 CFR 54.21(c)(1)(ii) OR Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.3
Environmental Qualification Analyses of Electrical Equipment	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.4

Table 4.1-1
List of PNPS TLAA and Resolution (Continued)

TLAA Description	Resolution Option	Section
Concrete Containment Tendon Prestress Analyses	Not applicable for PNPS	4.5
Containment Liner Plate, Metal Containment, and Penetrations Fatigue Analyses		4.6
Fatigue of primary containment	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.6.1
Other TLAA		4.7
Reflood thermal shock analyses of the reactor vessel internals	Analyses remain valid 10 CFR 54.21(c)(1)(i)	4.7.1
TLAA in BWRVIPs		4.7.2
BWRVIP-05, RPV circumferential welds analysis	Addressed in Section 4.2.5	4.7.2.1
BWRVIP-48, vessel ID attachment welds fatigue analysis	Analysis projected 10 CFR 54.21(c)(1)(ii).	4.7.2.2
BWRVIP-49, instrument penetrations fatigue analysis	Analysis projected 10 CFR 54.21(c)(1)(ii).	4.7.2.3
BWRVIP-74, reactor vessel • P/T curves analysis • Fatigue analysis • C_VUSE analysis • Circ/axial welds analysis	 Addressed Section 4.2.2. Addressed Section 4.3.1. Addressed Section 4.2.3. Addressed Section 4.2.5 and Section 4.2.6.	4.7.2.4
BWRVIP-76, core shroud fatigue analysis	Analysis projected 10 CFR 54.21(c)(1)(ii).	4.7.2.5

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 PNPS current licensing basis analyses evaluating reduction of fracture toughness of the PNPS 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) assuming an average capacity factor of 90% for 60 years.

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.

Fluence values were calculated using the RAMA fluence methodology. The RAMA fluence methodology was developed for the Electric Power Research Institute, Inc. and the boiling water reactor vessel and internals project (BWRVIP) for the purpose of calculating neutron fluence in boiling water reactor components. This methodology has been approved by the NRC (Reference 4.2-20) for application in accordance with Regulatory Guide (RG) 1.190. The following fluence values are used throughout the remainder of Section 4.2.

Location	Surface Fluence	1/4 T Fluence, n/cm^2
Lower shell	1.01×10^{18}	6.09×10^{17}
Lower intermediate shell	1.28×10^{18}	8.40×10^{17}
Lower shell axial welds	8.17×10^{17}	5.00×10^{17}
Lower intermediate shell axial welds	1.14×10^{18}	7.63×10^{17}
Lower shell to lower intermediate shell circumferential welds	8.69×10^{17}	5.7×10^{17}
Reactor recirculation inlet nozzle	2.81×10^{17}	2.02×10^{17} [1]

1.Calculated using RG 1.99 formulas and the given surface fluence.

At PNPS, the limiting beltline material for 40 years consists of 6 plates and their connecting welds, all adjacent to the active fuel zone. No nozzles are included in the limiting beltline materials for the current term of operation (Reference 4.2-2).

The beltline was re-evaluated for 60 years. The fluence calculation shows that the reactor recirculation inlet nozzles will exceed 1 x 10^{17} n/cm^2 (E > 1 MeV) at 54 EFPY (1/4 T fluence = 2.02 x 10^{17} n/cm^2 (E > 1 MeV)). This remains well below the 8.4 x 10^{17} n/cm^2 (E > 1 MeV) 1/4 T fluence incurred by the limiting plates and welds in the vessel. An evaluation of the RT_{NDT} for these nozzle forgings and welds shows that their adjusted reference temperature at 54 EFPY will be well below the adjusted reference temperatures used in determining the P-T limits. Thus, the nozzle forgings and welds are not the limiting items 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.

In 2000, PNPS submitted a license amendment request to change the P-T limits to account for 20, 32, and 48 EFPY of operation (Reference 4.2-4**.** However, the NRC staff concluded that the fluence values were based on an outdated calculation method and were not credible. Therefore, the limits were approved for use only through operating Cycle 14 (Reference 4.2-5)**.** In 2002, PNPS submitted a request to extend the use of these curves through the end of Cycle 15 (Reference 4.2-6). Changes to this submittal, including a request to use the present curves through the end of operating Cycle 16 (corresponding to approximately 23 EFPY, expected to occur in 2007) were then submitted in order to allow PNPS to benefit from data gathered through the BWRVIP Integrated Surveillance Program / Supplemental Surveillance Program (ISP/SSP). In this submittal, PNPS committed to develop and submit updated P-T limit curves and revised fluence calculations based on an NRC-approved calculation method that adheres to Regulatory Guide 1.190 prior to the end of operating Cycle 16 (Reference 4.2-7). License Amendment 197 granted this request in 2003 (Reference 4.2-8).

Recent fluence calculations done per RG 1.190 confirm that the fluence for 54 EFPY is less than the fluence used to calculate the P-T limits in Reference 4.2-5. Consequently, the existing Technical Specification P-T limits remain valid for the period of extended operation. The P-T limit TLAA thus remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

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 PNPS beltline welds were provided to the NRC in correspondence responding to Generic Letter 92-01 (References 4.2-9, 4.2-10).

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 surveillance data. Position 2 requires a minimum of two sets of credible material surveillance data. Since PNPS has data from only one material surveillance capsule, Position 2 does not apply. 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 predictions for percent drop in C_VUSE at 54 EFPY are based on chemistry data, the maximum 1/4 T fluence values, and unirradiated C_VUSE data submitted to the NRC in the PNPS response to GL 92-01. The predicted C_VUSE values for 54 EFPY utilize Regulatory Guide 1.99 Position 1 and are summarized in Table 4.2-1. The predictions used Regulatory Guide 1.99, Position 1, Figure 2; specifically, the formula for the lines was used to calculate the percent drop in C_VUSE (Reference 4.2-14).

Using chemistry data from previous licensing submittals, the PNPS response to GL 92-01 (References 4.2-9, 4.2-10, 4.2-14), and the 1/4 T fluence values listed in Section 4.2.1, linear interpolation was performed on the C_VUSE percent drop values in RG 1.99, Revision 2, Figure 2.

All projected C_VUSE values remain well above the requirement of 50 ft-lbs during the period of extended operation. 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).

The license renewal SER for BWRVIP-74 (Reference 4.2-11), Action Item #10, states that each license renewal applicant shall demonstrate that the percent reduction in Charpy USE for their beltline materials is less than that specified for the limiting BWR/3-6 plates and the non-Linde 80 submerged arc welds given in BWRVIP-74. This action item is not applicable to PNPS because the PNPS projected C_VUSE remains above the 50 ft-lb limit, even for the period of extended operation.

Table 4.2-1
PNPS 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 CvUSE	1/4 T fluence (10^{19} n/cm^2)	% Drop in USE	USE (1/4 T)
Lower intermediate shell	A533B	G-3108-1	C-2921-2	0.14	81	0.084	12.79	70.6
Lower intermediate shell	A533B	G-3108-2	C-2945-1	0.10	80	0.084	10.57	71.5
Lower intermediate shell	A533B	G-3108-3	C-2945-2	0.10	81	0.084	10.57	72.4
Lower shell	A533B	G-3109-1	C-2957-1	0.10	76	0.061	9.79	68.6
Lower shell	A533B	G-3109-2	C-2957-2	0.10	79	0.061	9.79	71.3
Lower shell	A533B	G-3109-3	C-2973-1	0.11	72	0.061	10.31	64.6
Lower int/lower shell circ weld	Linde 1092	1-334	21935	0.18	75	0.057	16.39	62.7
Lower int shell axial welds	Linde 1092	1-338A,B,C	27204-12008	0.22	75	0.076	19.52	60.4
Lower shell axial welds	Linde 1092	2-338A,B,C	27204	0.20	75	0.050	16.87	62.3

4.2.4 Adjusted Reference Temperature

Irradiation by high-energy neutrons raises the value of RT_{NDT} for the reactor vessel. RT_{NDT} is the reference temperature for nil-ductility transition as defined in Section NB-2320 of the ASME Code. 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. The margin is defined in RG 1.99, Revision 2. The P-T curves are developed from the ART value for the vessel materials. RG 1.99 Revision 2 defines the calculation methods for RT_{NDT} and ART.

The PNPS reactor vessel was evaluated for an assumed exposure of less than 10^{19} nvt of neutrons with energies exceeding 1 MeV (Reference 4.2-1). After approximately 4.17 EFPY, the first surveillance capsule was withdrawn from the vessel and tested. The capsule test report concludes that the shift in RT_{NDT} and upper-shelf energy over 32 EFPY will be within 10 CFR 50 guidelines.

PNPS projected values for ΔRT_{NDT} and ART at 54 EFPY using the methodology of RG 1.99. The projected values of ART are shown in Table 4.2-2. These values were calculated using the chemistry data, margin values, initial RT_{NDT} values, and chemistry factors (CFs) contained in the PNPS response to GL 92-01 (References 4.2-3, 4.2-9, 4.2-10, 4.2-13). Initial RT_{NDT} values are from report SIR-00-082, which was submitted in 2001 as part of the PNPS P-T limit change request (Reference 4.2-5). 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 4.2-2 projects ART through the period of extended operation in accordance with 10 CFR 54.21(1)(c)(ii).

Table 4.2-2
PNPS 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} (Deg 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 intermediate shell	A533B	G-3108-1	C-2921-2	0.14	0.6	100	-30	0	0.084	0.383	38.3	17.0	34.0	42.3
Lower intermediate shell	A533B	G-3108-2	C-2945-1	0.10	0.65	66	-7	0	0.084	0.383	25.1	12.5	25.1	43.2
Lower intermediate shell	A533B	G-3108-3	C-2945-2	0.10	0.66	66	-12	0	0.084	0.383	25.1	12.6	25.1	38.2
Lower shell	A533B	G-3109-1	C-2957-1	0.10	0.48	65	-3	0	0.061	0.325	21.1	10.6	21.1	39.3
Lower shell	A533B	G-3109-2	C-2957-2	0.10	0.47	65	0	0	0.061	0.325	21.1	10.6	21.1	42.3
Lower shell	A533B	G-3109-3	C-2973-1	0.11	0.63	74	-4	0	0.061	0.325	24.2	12.1	24.2	44.4
Lower int/ lower shell circ weld	Linde 1092	1-334	21935	0.18	0.7	172	-50	0	0.057	0.314	53.7	26.9	53.7	57.5
Lower int shell axial welds	Linde 1092	1-338A,B,C	27204-12008	0.22	1	231	-48	0	0.076	0.365	84.7	28.0	56.0	92.7
Lower shell axial welds	Linde 1092	2-338A,B,C	27204	0.20	1.02	225	-34	0	0.050	0.293	65.9	28.0	56.0	87.9

4.2.5 Reactor Vessel Circumferential Weld Inspection Relief

Relief from reactor vessel circumferential weld examination requirements under Generic Letter 98-05 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.

PNPS received NRC approval for this relief for the remainder of the original 40-year license term. The basis for this relief request is an analysis that satisfied the limiting conditional failure probability for the circumferential welds at the expiration of the current license, based on BWRVIP-05 and the extent of neutron embrittlement (References 4.2-16, 4.2-17). The anticipated changes in metallurgical conditions expected over the extended operating period require additional analysis to extend this relief request.

The NRC evaluation of BWRVIP-05 utilized the FAVOR code to perform a probabilistic fracture mechanics (PFM) analysis to estimate the reactor pressure vessel (RPV) shell weld failure probabilities. Three key inputs to the PFM analysis are (1) the estimated end-of-life mean neutron fluence, (2) mean chemistry values based on vessel types, and (3) the assumption of potential for beyond-design-basis events.

Table 4.2-3 compares the PNPS reactor vessel limiting circumferential weld parameters to those used in the NRC analysis for the first two key assumptions. The data in column one (CEOG 32 EFPY) is from the NRC SER for PNPS Relief Request 28 (Reference 4.2-17), and repeats the data in Table 2.6.4 of the NRC SER for BWRVIP-05 (Reference 4.2-18). The data in column two (PNPS 32 EFPY) is from the NRC SER for PNPS Relief Request 28 (Reference 4.2-17). The data in the third 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 (References 4.2-18, 4.2-19). The data in the last column is the projected 54 EFPY data for PNPS taken from Table 4.2-2. (For comparison to the earlier data, the EOL mean RT_{NDT} is calculated without margin and hence is lower than the Table 4.2-2 RT_{NDT} value.)

The chemistry composition and chemistry factor values for PNPS are the same as those used in the NRC analysis; however, the 54 EFPY fluence value is lower than the corresponding 64 EFPY generic value. As a result, the shift in reference temperature is lower than the 64 EFPY shift in the NRC analysis. In addition, the unirradiated reference temperature of the PNPS material is lower than the initial value assumed in the NRC analysis (References 4.2-3, 4.2-18). The combination of a lower initial reference temperature ($RT_{NDT(U)}$) and a lower shift (RT_{NDT} w/o margin) yields an adjusted reference temperature that is considerably lower than the NRC mean analysis value. Although a conditional failure probability has not been calculated, the mean RT_{NDT} value for PNPS at 54 EFPY is less than the 64 EFPY mean provided by the NRC. Therefore, the PNPS RPV conditional failure probability is less than that of the NRC analysis. 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).

The procedures and training used to limit cold over-pressure events will be the same as those approved by the NRC when PNPS requested approval of the BWRVIP-05 technical alternative for the current license term.

Table 4.2-3
Effects of Irradiation on PNPS RPV Circumferential Weld Properties

Plant / Parameter Description	CEOG/ 32 EFPY Bounding Parameters	PNPS/ 32 EFPY Beltline Circ Weld	CEOG/ 64 EFPY Bounding Parameters	PNPS/ 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}	8.00×10^{17}	4.00×10^{18}	8.69×10^{17}
Fluence factor (FF) (calculated per RG 1.99 based on fluence in previous line)	0.569	0.374	0.746	0.389
Weld copper content, %	0.183	0.183	0.183	0.183
Weld nickel content, %	0.704	0.704	0.704	0.704
Weld chemistry factor (CF)	172.2	172.2	172.2	171
Fluence factor times chemistry factor (FF x CF)	98.1	64.5	128.5	66.6
Margin (implied), °F	0.0	0.0	0.0	0.0
Increase in reference temperature (ΔRT_{NDT}), °F (FF x CF + Margin)	98.1	64.5	128.5	66.6
Mean adjusted reference temperature (ART), °F ($RT_{NDT} + \Delta RT_{NDT}$)	98.1	14.5	128.5	16.6

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 4.2-18). 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.

PNPS received relief from the circumferential weld inspections for the remainder of the original 40-year operating term (Reference 4.2-17). The basis for this relief request was a plant-specific analysis that showed the limiting conditional failure probability for the PNPS circumferential welds at the end of the original operating term was less than the values calculated in the BWRVIP-05 SER (Reference 4.2-11). The BWRVIP-05 SER concluded that the reactor vessel failure frequency due to failure of the limiting axial welds in the BWR fleet at the end of 40 years of operation is less than $5x10^{-6}$ per reactor year. This failure frequency is dependent upon given assumptions of flaw density, distribution, and location. The failure frequency also assumes that "essentially 100%" of the reactor vessel axial welds will be inspected. The PNPS relief request requires additional relief request if less than 90% coverage is achieved.

Table 4.2-4 compares the PNPS reactor vessel limiting axial weld parameters to those used in the NRC analysis. The data in column one (CEOG 64 EFPY) is from Table 2.6.4 of the NRC SER for BWRVIP-05 (Reference 4.2-18). The data in column two (Clinton) is from the NRC Supplemental SER for BWRVIP-05 (Reference 4.2-19). The data in the third column is the projected 54 EFPY data for Pilgrim taken from Table 4.2-2. (For consistency with columns 1 and 2, the EOL mean RT_{NDT} is calculated without margin and hence is lower than the Table 4.2-2 RT_{NDT} value.)

The supplemental SER required the limiting axial weld to be compared with data found in Table 3 of the document. Originally, the supplemental SER identified PNPS as a limiting plant for the BWR fleet; however, in the discussion it is noted that the high EOL value of RT_{NDT} for PNPS calculated by the BWRVIP is due to the use of an initial RT_{NDT} of 0°F. The supplemental SER notes that the docketed value of initial RT_{NDT} (from the RVID) is -48°F, and therefore the EOL value of RT_{NDT} for PNPS is not bounding for the BWR fleet. The supplemental SER stated that the axial welds for the Clinton plant are the limiting welds for the BWR fleet and vessel failure probability determined for Clinton should bound the BWR fleet.

The limiting axial weld chemistry, chemistry factor (CF), fluence and 54 EFPY mean RT_{NDT} values are within the limits of the values assumed in the analysis performed by the NRC staff in the BWRVIP-05 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 4.2-4
Effects of Irradiation on PNPS RPV Axial Weld Properties

Plant/Parameter Description	CEOG/ NRC Limiting Plant-Specific Data	Clinton/ (NRC SER Supplement)	PNPS/ Data for Axial Weld
EFPY	64		54
Initial (unirradiated) reference temperature (RT_{NDT}), °F	0	-30	-48
Neutron fluence at the end of the requested relief period, n/cm^2	4.00 x 10^{18}	6.90 x 10^{18}	1.14 x 10^{18}
Fluence factor (FF) (calculated per RG 1.99 based on fluence in previous line)	0.746	0.896	0.444
Weld copper content, %	0.219	0.10	0.219
Weld nickel content, %	0.996	1.08	0.996
Chemistry factor (CF)	231.1	135.0	232
Increase in reference temperature (ΔRT_{NDT}), °F (FF x CF)	172.4	121.0	102.9
Mean adjusted reference temperature (ART), °F (RT_{NDT} + ΔRT_{NDT})	172.4	91.0	54.9

4.2.7 References

4.2-1 PNPS Updated Final Safety Analysis Report, Revision 24.

4.2-2 U.S. NRC, Reactor Vessel Integrity Database (RVID).

4.2-3 Miller, H. (NRC), to M. Bellamy (ENGC), "Additional Information Related to Pilgrim Technical Specification Change Concerning Pressure-Temperature Limit Curves of Figure 3.6.1.2 and 3," ENGC Letter 2.01.014 dated January 30, 2001.

4.2-4 Bellamy, R. (Entergy) to NRC, "Request for Technical Specification Change Concerning Pressure-Temperature Limit Curves of Figure 3.6.1, 3.6.2, and 3.6.3," ENGC Letter 2.00.080 dated November 22, 2000.

4.2-5 Wang, A., (NRC) to M. Bellamy (ENGC), "Pilgrim Nuclear Power Station – Issuance of Amendment Re: Pressure-Temperature Limit Curves (TAC No.MB0561)," letter dated April 13, 2001.

4.2-6 Dugger, C. M. (Entergy) to NRC, "Change in Applicability of Pilgrim's Pressure-Temperature Curves as Described in Technical Specification Figures 3.6.1, 3.6.2, and 3.6.3," ENGC Letter 2.02.021 dated May 1, 2002.

4.2-7 Dugger, C. M. (Entergy) to NRC, "Proposed Change to Applicability of Pilgrim's Pressure-Temperature Curves as Described in Technical Specification Figures 3.6.1, 3.6.2, and 3.6.3, Revision 1," ENGC Letter 2.02.100 dated December 4, 2002.

4.2-8 Amendment 197 to Facility Operating License DPR-35, Docket No. 50-293, March 28, 2003.

4.2-9 Boulette, E. T. (BECo), to NRC, "Response to RAI Concerning Generic Letter 92-01," BECo Letter 2.93.116 dated August 30, 1993.

4.2-10 Eaton, R. (NRC) to Boulette, E. T. (BECo), "Generic Letter 92-01, Rev. 1, Reactor Vessel Structural Integrity, Pilgrim Nuclear Power Station," BECo Letter 1.94.058 dated March 29, 1994.

4.2-11 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)," October 18, 2001.

4.2-12 Wang, A. (NRC), to M. Bellamy (ENGC), "Pilgrim Nuclear Power Station – Issuance of Amendment Re: Reactor Vessel Material Surveillance Interval (TAC No. MA9908)," letter dated April 2, 2001.

4.2-13 Alexander, J. F. (BECo), to NRC, “Response to a Request for Additional Information Regarding Reactor Pressure Vessel Integrity at Pilgrim Nuclear Power Station (TAC NO. MA1206),” BECo Letter 2.98.107 dated August 6, 1998.

4.2-14 NUREG/CR-5799, Review of Reactor Pressure Vessel evaluation for Yankee Rowe Nuclear Power Station, March 1992.

4.2-15 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.

4.2-16 Riggs, W. J. (Entergy), to NRC, “Pilgrim Relief Request (PRR)-28, Revision 1, Relief from ASME Code, Section XI, Examinations of Reactor Pressure Vessel Circumferential Welds, Pursuant to Generic Letter 98-05,” ENGC Letter 2.03.009 dated February 3, 2003.

4.2-17 Boska, J., (NRC) to M. Bellamy (ENGC), “Pilgrim Nuclear Power Station – Pilgrim Relief Request No. 28, Relief from ASME Code, Section XI, Examinations of Reactor Pressure Vessel Circumferential Shell Welds (TAC No. MB6074),” letter dated April 11, 2003.

4.2-18 BWRVIP-05 SER (Final), USNRC letter from Gus C. Lainas to Carl Terry, Niagara Mohawk Power Company, BWRVIP Chairman, *Final Safety Evaluation of the BWRVIP Vessel and Internals Project BWRVIP-05 Report, (TAC No. M93925)*, July 28, 1998.

4.2-19 BWRVIP-05 SER (Supplement), USNRC letter from Jack R. Strosnider, Jr., to Carl Terry, BWRVIP Chairman, *Supplement to Final Safety Evaluation of the BWRVIP Vessel and Internals Project BWRVIP-05 Report*, *(TAC No. MA3395)*, March 7, 2000.

4.2-20 Bateman, W. H. (NRC), to Eaton, W. (BWRVIP), "Safety Evaluation of Proprietary EPRI Reports BWRVIP-114, -115, -117, and -121 and TWE-PSE-001-R-001," letter dated May 13, 2005.

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. Fatigue analyses are treated as TLAA if they are based on a set of design transients that are based on the life of the plant.

When TLAA—metal fatigue is identified in the aging management program column, the TLAA associated with fatigue is applicable. Review of the TLAA, per 10 CFR 54.21 (c)(1) determines whether:

(i) the TLAA remains valid for the period of extended operation,

(ii) the TLAA can be 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).

Class 1 components (reactor vessel and recirculation system piping) are subject to a fatigue analysis in accordance with ASME Section III, Subsection NB. ASME Section III requires evaluation of fatigue by considering design thermal and loading cycles. PNPS monitors transient cycles that contribute to fatigue usage in accordance with requirements in PNPS Technical Specification 5.5.5. Reactor coolant system pressure boundary piping (with the exception of reactor recirculation 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.

The non-Class 1 aging management reviews for PNPS identify non-Class 1 mechanical components that are within the scope of license renewal and are subject to aging management review. Based on exposure to mechanical and thermal cycling, specific components are subject to cracking by fatigue.

Fatigue evaluations that meet the definition of TLAA for Class 1 and non-Class 1 mechanical components at PNPS are described and evaluated below. Cumulative usage factors have been documented and the actual numbers of design transient cycles have been projected to 60 years. Although some transients are projected to exceed the cycle limits before the end of 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 PNPS components are summarized in Table 4.3-1.

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

PNPS Class 1 components evaluated for fatigue and flaw growth include the reactor pressure vessel (RPV) and appurtenances, certain reactor vessel internals, the reactor recirculation system (RRS), and the reactor coolant system (RCS) pressure boundary. The PNPS 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 PNPS Class 1 components designed 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 40-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. The component analyses and stress reports contain the fatigue evaluations for each component.

A review of the fatigue evaluations reveals the maximum cumulative usage factors (CUFs) for applicable PNPS 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 cumulative usage factors (CUF) for Class 1 components are summarized in Table 4.3-1. There are two CUFs calculated for the main feedwater nozzles. The fatigue of the feedwater nozzles is a special case discussed in Section 4.3.1.4 below.

Table 4.3-1
Maximum CUFs for Class 1 Components

Location	CUF
Closure region	0.049
Closure studs	0.07
Bottom head and support skirt	0.044
Feedwater nozzle	
System transients	0.637[1]
Combined (rapid and system)	< 0.8[1]
Steam outlet nozzle	N/A[2]
Recirculation inlet nozzle	0.037
Recirculation outlet nozzle	N/A[2]
Core spray nozzle	0.01
Vessel shell	0.012
Vent nozzle	N/A[2]
Instrument nozzle	N/A[2]
Shroud stabilizer (tie rod)	0.330
RRS and branch piping—loop A	0.110
RRS and branch piping—loop B	0.094

1. The 0.637 usage factor for the feedwater nozzles is based on the allowable transients while the 0.8 usage factor is based on the allowable transients plus rapid thermal cycling due to thermal sleeve leakage. The 0.8 is calculated based on 33 years of operation, from the time of installation in year 7 of plant life to the end of a 40-year plant life. See Section 4.3.1.4 for more details.
2. Meets exclusion rules for ASME Code—fatigue analysis not required.

In accordance with plant Technical Specifications (Section 5.5.5), PNPS 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 PNPS Fatigue Monitoring Program tracks and evaluates the cycles and requires corrective actions if limits are approached. The PNPS 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	Original Design Basis Cycles	Current Design Basis Cycles	Cycles Logged as of 12/31/01	Projection Factor[1]	Projected Cycles at 40 Years	Projected Cycles at 60 Years[2]
1	Vessel bolt-up	123	22	14	0.47	19	28[3]
2	Vessel hydro	130	25	14	0.47	19	28[3]
3	Cold startup	120	212	110	3.23	144	209
4	Hot startup	120	337	165	5.49	222	332
5	50% reduction	14,600	379	254	8.46	342	512[3]
6	Loss of FWHTRs	80	10	6	0.20	8	12[3]
7	Loss of RFPs	10	26	10	0.14	11	14
8	Load reject	40	27	12	0.40	16	24
9	Other scrams	147	132	56	0.85	65	82
10	Recirc start	5	16	9	0.30	12	18[3]
11	Reduction to hot standby	118	176	84	2.80	113	169
12	Normal shutdown	118	145	96	3.20	129	194[3]
13	Reactor blowdown	2	47	10	0.00	10	10
14	Vessel floodup	118	20	13	0.43	17	26[3]
15	Vessel unbolt	123	22	13	0.43	17	26[3]

1. In most cases, the projection factor is the average number of events that have occurred each year during the plant's operation. Some cases consider anomalies that may have occurred or such things as improvements in operations and maintenance that may have reduced the frequency of occurrence in recent years, per the Fatigue Monitoring Program.
   Issuance of Operating License = June 8, 1972
   Date of Power Operation for PNPS = December 9, 1972
   Date at 60 Years of Operation = June 7, 2032
   Date of Latest Program Report = December 31, 2001
   Remaining Years for Projection = June 7, 2032 - December 31, 2001 = 30.4 Years
2. Projected Cycles at 60 Years of Operation = Current Cycles + (Projection Factor x 30.4)
3. These transients are projected to exceed the allowable cycle limit before the end of the period of extended operation.

4.3.1.1 Reactor Vessel

The reactor pressure vessel and the reactor recirculation system (RRS) piping were designed in accordance with ASME Section III.

The PNPS Fatigue Monitoring Program will assure that the allowed number of transient cycles is not exceeded. The program requires corrective action if transient cycle limits are approached. Consequently, the TLAA (fatigue analyses) based on those transients will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i) or the effects of aging on the intended function(s) will be adequately managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

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. However, a review of the design basis document reveals that the only internals component for which there is a fatigue analysis is the core shroud stabilizer (tie rods), the result of a repair to structurally replace circumferential shroud welds surrounding the core. This analysis is a TLAA. The maximum CUF identified for the shroud for 40 years of operation is 0.33. The CUF is included in Section 4.3.1. The Fatigue Monitoring Program ensures the fatigue analyses remain valid by monitoring the actual numbers of cycles and evaluating them against the design values for numbers of allowable cycles. Time-limited aging analyses (fatigue analyses) for the core shroud stabilizer will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i) or the effects of aging on the intended function(s) will be adequately managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.3 Class 1 Piping and Components

All RRS piping at PNPS, originally designed to ANSI B31.1, 1967 Edition, has been replaced in response to GL 88-01 and in accordance with NUREG-0313, including connecting portions of core spray, reactor water cleanup, and residual heat removal system piping. Fatigue evaluations were performed to assure that the cyclic load combinations for service levels A and B do not exceed Code allowables, and that cumulative usage factors do not exceed 1.0, in accordance with ASME Section III, Subsection NB. All remaining RCS pressure boundary piping is designed and analyzed in accordance with ANSI B31.1.

The recirculation system Loop A and Loop B piping analyses provide the fatigue design basis and were the source documents for the Class 1 piping CUFs. Current design basis fatigue evaluations are based on design transients. The design transients are tracked and evaluated to ensure that cycle limits are not exceeded, thereby assuring that CUFs do not exceed 1.0. Corrective actions are taken if limits are approached. Details of the Fatigue Monitoring Program are included in Appendix B. Continuation of this program, therefore, will ensure that the allowed number of transient cycles is not exceeded. Consequently, the TLAA (fatigue analyses) for

Class 1 piping and components will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i) or the effects of aging on the intended function(s) will be adequately managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.4 Feedwater Nozzle Fatigue

Table 4.3-1 has two CUFs for the main feedwater nozzles. The CUF of 0.637 is calculated based on the number of design transients consistent with other Class 1 components. The CUF of < 0.8 is based on the system design transients plus rapid thermal cycling of the feedwater nozzle due to leakage past the thermal sleeve. The nozzles were installed seven years into the 40-year life of the plant. The rapid cycling usage factor of < 0.8 is based on the system transient CUF plus the thermal cycling from 33 years of operation. It follows that the 33 years of operation was worth an additional 0.163 (0.8 – 0.637). The period of extended operation will add twenty years to the service life of the nozzles and would add approximately 0.099 (0.163/33 x 20) to the cumulative usage factor. This extrapolated usage factor for the feedwater nozzles, considering both the currently analyzed system design transients and rapid cycling through the period of extended operation, is thus < 0.899. Thus the main feedwater CUF including rapid thermal cycling has been projected for the period of extended operation in accordance with10 CFR 54.21(c)(1)(ii).

The Fatigue Monitoring Program will ensure that the allowed number of transient cycles is not exceeded. The program requires corrective action if transient cycle limits are approached. Consequently, the TLAA (fatigue analyses based on design transients) for the main feedwater nozzle will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i) or the effects of aging on the intended function(s) will be adequately managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

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. The design of ASME B31.1 Code components also incorporates stress reduction factors based upon an assumed number of thermal cycles. In general, 7000 thermal cycles are assumed, allowing a stress reduction factor of 1.0 in the stress analyses. PNPS 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).

Some applicants for license renewal have estimated that piping in the primary sampling system will have more than 7000 thermal cycles before the end of the period of extended operation. For PNPS, reactor coolant samples are taken every 96 hours during normal operation. However, the normal samples are taken from the RWCU filter influent, where the water has already been cooled. Thus normal sampling does not cause a thermal cycle. Alternate samples may be taken directly from the B discharge header of the reactor recirculation system via containment penetration X-41A; however, this procedure is infrequently used and this piping, designed to ASME B31.1, will not exceed 7000 cycles prior to 60 years of operation.

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 PNPS-vintage General Electric plants. These locations and the subsequent calculations are directly relevant to PNPS.

1. reactor vessel shell and lower head
2. reactor vessel feedwater nozzles
3. reactor recirculation (RRS) 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

Entergy evaluated the limiting locations (a total of nine components corresponding with the above six locations) using the guidance provided in NUREG-1801 (Volume 2, Section X.M.1). Four of nine components reviewed have environmentally adjusted CUF of greater than 1.0 (see Table 4.3-3). The ASME Code does not require environmental adjustment to fatigue analyses.

Prior to entering the period of extended operation, for each location that may exceed a CUF of 1.0 when considering environmental effects, PNPS 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;

(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 PNPS 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. Cracking by environmentally-assisted fatigue of these locations is addressed using one of the above three approaches in accordance with 10 CFR 54.21(c)(1).

Table 4.3-3
PNPS Cumulative Usage Factors for NUREG/CR-6260 Limiting Locations

No.	NUREG-6260 Location	CUF	Material	F_{en}	Environmentally Adjusted CUF
1	Vessel shell and bottom head	0.044	Low alloy steel	2.45	0.11
2	Feedwater nozzle	0.637	Low alloy steel	2.57	1.64
3A	RR inlet nozzle	0.037	Low alloy steel	2.45	0.09
3B	RR outlet nozzle	0.310[1]	Low alloy steel	2.45	0.76
3C	RR piping tee	0.110	Stainless steel	15.35	1.69
4A	Core spray nozzle	0.010	Low alloy steel	2.45	0.02
4B	Core spray safe end	0.182[1]	Stainless steel	15.35	2.79
5	RHR return piping	0.094	Stainless steel	15.35	1.44
6	Feedwater piping	0.427[1]	Carbon steel	2.10	0.90

1. No PNPS-specific value was available; used generic value from NUREG/CR-6220.

4.4 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC EQUIPMENT

The PNPS 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 PNPS program is an existing program established to meet PNPS commitments for 10 CFR 50.49. It is consistent with NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components."

The PNPS 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 PNPS 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 PNPS program in accordance with the requirements of 10 CFR 54.21(c)(1)(iii).

4.5 CONCRETE CONTAINMENT TENDON PRESTRESS

This section is not applicable since PNPS 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 PNPS 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 Reflood Thermal Shock of the Reactor Vessel Internals

UFSAR Section 3.3.6.8 addresses reflood thermal shock of the reactor vessel internals (core shroud). This evaluation of thermal shock is a TLAA as it is based on the shroud receiving a maximum integrated neutron fluence of 2.7×10^{20} n/cm^2 (E > 1 MeV) by the end of plant life. The maximum shroud fluence projected for the PNPS shroud at 54 EFPY is 1.84×10^{21} n/cm^2.

The shroud material is Type 304 stainless steel, which is not significantly affected by irradiation. BWRVIP-35, Fracture Toughness and Tensile Properties of Irradiated Austenitic Stainless Steel Components Removed from Service (Reference 4.7-2), concludes that the service limit of Type 304 stainless steel is approached at a fluence of 8×10^{21} n/cm^2. As the PNPS shroud will remain below that fluence level for the period of extended operation, the shroud will remain serviceable. As such, this TLAA has been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.7.2 TLAA in BWRVIP Documents

The BWR Vessel and Internals Project (BWRVIP) documents identify various potential TLAA. The TLAA applicable to PNPS are described below.

4.7.2.1 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.

4.7.2.2 BWRVIP-48, Vessel ID Attachment Welds

The BWRVIP-48 fatigue analyses for various configurations of different vessel ID bracket attachments are considered TLAA. The PNPS bracket configurations were included in the analysis. PNPS has no unique bracket configurations. Analysis of fatigue for 60 years showed that no CUFs are above 0.4. This analysis remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.7.2.3 BWRVIP-49, Instrument Penetrations

The BWRVIP-49 fatigue analysis of several configurations of instrumentation penetrations, including the PNPS configuration, is considered a TLAA. Analysis of fatigue for 60 years showed that all CUFs are below 0.4. This analysis remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.7.2.4 BWRVIP-74, 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 PNPS P-T curves.

(2) Fatigue

The SER states that the license renewal applicant should not rely solely on the analysis in BWRVIP-74, but should verify that the number of cycles assumed in the original fatigue design is conservative. Section 4.3 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. 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 addresses that the percent reduction in Charpy USE for beltline materials are less than those specified for limiting BWR/3-6 plates and non-Linde 80 submerged arc welds. This is not applicable to PNPS because projected Charpy USE remains above the 50 ft-lb limit throughout the period of extended operation. Section 4.2.3 addresses Charpy USE for reactor pressure vessel materials.

(4) Material Evaluation for Exempting RPV Circumferential Welds from Inspection

See Sections 4.2.5 for a discussion of the RPV circumferential weld inspection relief.

4.7.2.5 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. A review of the reactor vessel and internals design basis document found that the only TLAA was the fatigue analysis and calculation of CUFs for the shroud repair. Section 4.3.1.2 addresses the fatigue evaluation for the core shroud stabilizers (tie rods), which are the result of the repair.

4.7.3 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 BWRVIP-35, Fracture Toughness and Tensile Properties of Irradiated Austenitic Stainless Steel Components Removed from Service, EPRI Report TR-108279, June 1997.