LICENSE RENEWAL APPLICATION

COLUMBIA GENERATING STATION

January 2010

PREFACE

The following describes the content of the Columbia Generating Station (Columbia) 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. 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. Note that the use of blue font in the text of the application indicates that a hyperlink is provided for ease of navigation.

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

Section 2 describes the process for identification of structures and components subject to aging management review (AMR) in the Columbia integrated plant assessment (IPA). The results of applying the scoping methodology are provided in Table 2.2-1, Table 2.2-2, and Table 2.2-3. These tables provide listings of the mechanical systems, the electrical and instrumentation and control systems, and the structures within the scope of license renewal, respectively. Section 2 also provides descriptions of the in-scope systems and structures and their intended functions with tables identifying the components requiring aging management review and their component intended functions.

Section 3 contains the aging management review results for those mechanical, electrical, and structural components determined to be subject to aging management review. Section 3 is divided into six sections that address the areas of: (3.1) Reactor Vessel, Internals, and Reactor Coolant System, (3.2) Engineered Safety Features, (3.3) Auxiliary Systems, (3.4) Steam and Power Conversion Systems, (3.5) Containments, Structures, and Component Supports, and (3.6) Electrical and Instrumentation and Control Systems. 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 industry guidance for format and content of applications that rely on NUREG-1800, "Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants", Revision 1, (the SRP-LR). The tables include comparisons with the evaluations documented in NUREG-1801, Revision 1.

Section 4 addresses time-limited aging analyses, as defined by 10 CFR 54.3. The review includes the identification of the component or subject of each time-limited aging analysis, and an explanation of the time-dependent aspects of the associated calculation or analysis. In compliance with 10 CFR 54.21(c), Section 4 demonstrates that either: (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 functions will be adequately managed for the period of extended operation.

In compliance with 10 CFR 54.21(d), Appendix A, Final Safety Analysis Report Supplement, provides a summary description of the programs and activities credited 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 included. Appendix A also contains a listing of commitments associated with license renewal, including those related to aging management programs and time-limited aging analyses.

Appendix B, Aging Management Programs, describes the programs and activities that are credited for aging management. The programs and activities assure that the effects of aging will be managed such that the components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. Appendix B also addresses programs that are credited in the disposition of time-limited aging analyses.

The information contained in Section 2, Section 3, and Appendix B fulfills the requirements of 10 CFR 54.21(a).

Appendix C, Response to BWRVIP Applicant Action Items, provides the requested responses to applicant action items contained in the NRC safety evaluation reports associated with NRC-approved Boiling Water Reactor Vessel and Internals Project (BWRVIP) reports.

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, Applicant's Environmental Report – Operating License Renewal Stage, provides the environmental review associated with the period of extended operation. The information in Appendix E fulfills the requirements in 10 CFR 54.23.

In accordance with 10 CFR 54.21(b), this application will be updated annually.

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
AAI	Applicant Action Item
AC	Alternating Current
ACI	American Concrete Institute
ACSR	Aluminum Conductor Steel Reinforced
ADS	Automatic Depressurization System
AEM	Aging Effect / Mechanism
AISC	American Institute of Steel Construction
aka	also known as
AMP	Aging Management Program
AMR	Aging Management Review
ANSI	American National Standards Institute
AQ	Augmented Quality
AR	Action Request
ARI	Alternate Rod Injection/Alternate Rod Insertion
ART	Adjusted Reference Temperature
ASD	Adjustable Speed Drive
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	Anticipated Transients Without Scram
B&PV	Boiler and Pressure Vessel
BOP	Balance of Plant
BPA	Bonneville Power Administration
BRE	Bullet Resistant Enclosure
BTP APCSB	Branch Technical Position Auxiliary Power Conversion Systems Branch
BWR	Boiling Water Reactor
BWROG	Boiling Water Reactor Owners Group
BWRVIP	Boiling Water Reactor Vessel and Internals Project
C (ºC)	Degrees Celsius
CAS	Control Air System
CASS	Cast Austenitic Stainless Steel
CB&I	Chicago Bridge & Iron
CCH	Control Room Chilled Water
CF	Chemical Feed
CFR	Code of Federal Regulations
CJW	Cooling Jacket Water
CLB	Current Licensing Basis
CLTP	Currently Licensed Thermal Power
CMAA	Crane Manufacturers Association of America

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
CMS	Containment Monitoring System
CMTR	Certified Material Test Report
CMU	Concrete Masonry Unit
CO	Condensate (Auxiliary)
COND	Condensate (Nuclear)
CR	Condition Report
CRD	Control Rod Drive
CRDRL	Control Rod Drive Return Line
CSS	Core Support Structures
CST	Condensate Storage Tank
CVB	Containment Vacuum Breaker
CW	Circulating Water
Cu	Copper
CUF	Cumulative Usage Factor
DBT	Design Basis Threat
DC	Direct Current
DCW	Diesel Cooling Water
DE	Diesel Exhaust
DEA	Diesel Building Exhaust Air
DG	Diesel Generator
DLO	Diesel Lubricating Oil
DMA	Diesel Building Mixed Air
DO	Diesel Fuel Oil
DOA	Diesel Building Outside Air
DOT	Department of Transportation
DP	Differential Pressure
DRA	Diesel Building Return Air
DSA	Diesel Starting Air
DW	Demineralized Water
EAF	Environmentally Assisted Fatigue
ECCS	Emergency Core Cooling System
EDR	Equipment Drains Radioactive
EFPY	Effective Full Power Years
EMA	Equivalent Margin Analysis
EOF	Emergency Operations Facility
EPN	Equipment Piece Number
EPR	Ethylene Propylene Rubber
EPRI	Electric Power Research Institute

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
EPRI-MRP	Electric Power Research Institute Materials Reliability Program
EQ	Environmental Qualification
ESF	Engineered Safety Features
F (ºF)	Degrees Fahrenheit
FAC	Flow Accelerated Corrosion
FD	Floor Drain
FDR	Floor Drain Radioactive
F_{en}	Environmentally Assisted Fatigue Correction Factor
FO	Fuel Oil
FP	Fire Protection
FPC	Fuel Pool Cooling
FSAR	Final Safety Analysis Report
FW	Feedwater
GALL	Generic Aging Lessons Learned (the GALL Report is NUREG-1801)
GE	General Electric
GL	Generic Letter
GSI	Generic Safety Issue
HAZ	Heat-Affected Zone
HELB	High Energy Line Break
HEPA	High Efficiency Particulate Air
HPCS	High-Pressure Core Spray
HSSF	Hydrogen Storage and Supply Facility
HVAC	Heating, Ventilation, and Air Conditioning
HWC	Hydrogen Water Chemistry
IASCC	Irradiation Assisted Stress Corrosion Cracking
I&C	Instrumentation and Control
ID	Inside Diameter
I.D.	Identification
IEEE	Institute Of Electrical And Electronic Engineers
IGA	Intergranular Attack
IGSCC	Intergranular Stress Corrosion Cracking
IHSI	Induction Heating Stress Improvement
IN	Information Notice
INPO	Institute Of Nuclear Power Operations
IPA	Integrated Plant Assessment (10 CFR 54.21(a))
IR	Instrument Rack
ISFSI	Independent Spent Fuel Storage Installation
ISI	In-Service Inspection

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
ISP	Integrated Surveillance Program
ISP (E)	Integrated Surveillance Program for the extended period
ksi	Kilo-pounds per square inch
kV	Kilo-volt
LCS	Licensee Controlled Specifications
LD	Leak Detection
LLRT	Local Leak Rate Test
LOCA	Loss of Coolant Accident
LPCI	Low-Pressure Coolant Injection
LPCS	Low-Pressure Core Spray
LPRM	Local Power Range Monitor
LR	License Renewal
LR-ISG	Interim Staff Guidance Associated with License Renewal
LRA	License Renewal Application
LTOP	Low-Temperature Overpressure Protection
MCC	Motor Control Center
MD	Miscellaneous Drain
MEB	Metal-Enclosed Bus
MEL	Master Equipment List
MeV	Million Electron Volts
MIC	Microbiologically Influenced Corrosion
MRSM	Maintenance Rule Scoping Matrix
MS	Main Steam
MSIP	Mechanical Stress Improvement Process
MSIV	Main Steam Isolation Valve
msl	Mean Sea Level
MSLC	Main Steam Isolation Valve Leakage Control
MSRV	Main Steam Relief Valve
MWt	Megawatts-thermal
MWe	Megawatts-electric
MWR	Miscellaneous Waste Radioactive
N/A	Not Applicable
NDE	Nondestructive Examination
NEI	Nuclear Energy Institute
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
Ni	Nickel
NPS	Nominal Pipe Size

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
NRC	Nuclear Regulatory Commission
NSAS	Non-safety Affecting Safety
NSR	Non-safety Related
NSSS	Nuclear Steam Supply System
NUREG	Designation of publications prepared by the NRC staff
NWC	Normal Water Chemistry
OBE	Operating Basis Earthquake
OCB	Oil Control Circuit Breaker
OCCW	Open-Cycle Cooling Water
OLTP	Original Licensed Thermal Power
OQAPD	Operational Quality Assurance Program Description
PAAP	Protected Area Access Point
P&ID	Piping and Instrumentation Diagrams
PAP	Primary Access Point (Security)
PEA	Pump House Exhaust Air
PEC	Plant Engineering Center
PER	Problem Evaluation Report
PFSS	Post-Fire Safe Shutdown
PGCC	Power Generation Control Room Complex
pH	Concentration of Hydrogen Ions
PI	Process Instrumentation
PMA	Pump House Mixed Air
POA	Pump House Outside Air
PMP	Probable Maximum Precipitation
PPM	Parts Per Million
PRA	Pump House Return Air
PS	Process Sampling
PSD	Plant Sanitary Drains
PSF	Plant Support Facility
PSIG	Pounds Per Square Inch Gauge
PSR	Process Sampling Radioactive
P-T	Pressure-Temperature
PUD	Public Utility District
PVC	Polyvinyl Chloride
PWC	Potable Cold Water
PWH	Potable Hot Water
PWR	Pressurized Water Reactor (Columbia is a BWR design)
QA	Quality Assurance

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
QID	Qualification Information Document
RCA	Radiologically Controlled Area
RCC	Reactor Closed Cooling Water
RCIC	Reactor Core Isolation Cooling
REA	Reactor Building Exhaust Air
RFW	Reactor Feedwater
RG	Regulatory Guide
RHR	Residual Heat Removal
RI	Reactor Internals
ROA	Reactor Building Outside Air
RPS	Reactor Protection System
RPT	Recirculation Pump Trip
RPV	Reactor Pressure Vessel
RRA	Reactor Building Return Air
RRC	Reactor Recirculation
RT	Radiographic Testing
RT_{NDT}	Reference Temperature for Nil-Ductility Transition
RVID2	Reactor Vessel Integrity Database
RWCU	Reactor Water Cleanup
SA	Service Air
SBO	Station Blackout
SCC	Stress Corrosion Cracking
SCCM	Standard Cubic Centimeters Per Minute
SDV	Scram Discharge Volume
SER	Safety Evaluation Report
SGT	Standby Gas Treatment
SLC	Standby Liquid Control
SOC	Statement of Consideration
SPTM	Suppression Pool Temperature Monitoring
SRP-LR	Standard Review Plan for License Renewal
SRV	Safety Relief Valve
SS	Stainless Steel
SSCs	Systems, Structures, and Components (10 CFR 54.4(a))
SSE	Safe Shutdown Earthquake
SSW	Sacrificial Shield Wall
SW	Standby Service Water
TG	Turbine Generator
TIP	Traversing Incore Probe

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
TLAA	Time-Limited Aging Analysis
TMU	Tower Make-Up Water
TS	Technical Specifications
TSW	Plant Service Water
UHS	Ultimate Heat Sink
URI	Unresolved Item
USE	Upper Shelf Energy
USI	Unresolved Safety Issue
UT	Ultrasonic Testing
VDC	Volts direct current
WA	Washington (state)
XLPE	Cross-linked Polyethylene
XLPO	Cross-linked Polyolefin
WCH	Radwaste Building Chilled Water
WEA	Radwaste Building Exhaust Air
WMA	Radwaste Building Mixed Air
WOA	Radwaste Building Outside Air
WRA	Radwaste Building Return Air
Zn	Zinc

[This page intentionally blank]

TABLE OF CONTENTS

TABLE OF CONTENTS

Section | Page Number

TABLE OF CONTENTS

TABLE OF CONTENTS

Section | Page Number

TABLE OF CONTENTS

Section Page Number

TABLE OF CONTENTS

TABLE OF CONTENTS

Section Page Number

TABLE OF CONTENTS

Section | Page Number

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

Section | Page Number

TABLE OF CONTENTS

Section | Page Number

TABLE OF CONTENTS

APPENDICES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS

FIGURES

[This page intentionally blank]

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 the Columbia Generating Station (Columbia). The current facility operating license (NPF-21) expires at midnight on December 20, 2023. This application also seeks renewal of the source material, special nuclear material, and by-product material licenses that are subsumed in or combined with the facility operating license.

This application is organized in accordance with Regulatory Guide 1.188, “Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses,” Revision 1, and is consistent with guidance provided by Nuclear Energy Institute (NEI) 95-10, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule,” Revision 6. In addition, a summary of those Nuclear Regulatory Commission (NRC) Interim Staff Guidance (LR-ISG) documents that remain open is presented in the application.

This application is intended to provide sufficient information for the NRC to complete its technical and environmental reviews pursuant to 10 CFR 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants,” and 10 CFR 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions,” respectively.

This application is designed to allow the NRC to make the findings required by 10 CFR 54.29, “Standards for issuance of a renewed license,” in support of the issuance of a renewed facility operating license for Columbia.

[This page intentionally blank]

1.1 GENERAL INFORMATION

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

1.1.1 Name of Applicant

Energy Northwest, the current licensee and renewal applicant, is a municipal corporation and joint operating agency of the state of Washington.

Columbia is owned and operated by Energy Northwest.

1.1.2 Address of Applicant

Address of Columbia and Principal Location of Business

Energy Northwest
Columbia Generating Station
76 North Power Plant Loop
Richland, WA 99354

Address of Energy Northwest

Energy Northwest
P.O. Box 968
Richland, WA 99352-0968

1.1.3 Description of Business of Applicant

Energy Northwest, the licensee for Columbia, is a joint operating agency comprising 22 public utility districts (PUDs) and five municipalities. The 27 member utilities are Asotin County PUD, Benton County PUD, Chelan County PUD, Clallam County PUD, Clark County PUD, Cowlitz County PUD No. 1, Ferry County PUD, Franklin County PUD, Grant County PUD, Grays Harbor County PUD, Jefferson County PUD, Kittitas County PUD, Klickitat County PUD, Lewis County PUD, Mason County PUD No. 1, Mason County PUD No. 3, Okanogan County Public Utilities, Pacific County PUD No. 2, Skamania County PUD, Snohomish County PUD, Wahkiakum County PUD, Whatcom County PUD, City of Centralia, City of Port Angeles, City of Richland, Seattle City Light, and Tacoma Public Utilities. Energy Northwest provides electricity, at cost, to public power utilities and municipalities in the northwestern United States.

Energy Northwest owns and operates four electricity generating stations: Columbia (nuclear power plant), Packwood Lake Hydroelectric Project, Nine Canyon Wind Project, and White Bluffs Solar Station. Electrical energy produced by Energy Northwest at Columbia is delivered to electrical distribution facilities owned and operated by Bonneville Power Administration as part of the Federal Columbia River Power System.

1.1.4 Organization and Management of Applicant

Energy Northwest is a municipal corporation and joint operating agency of the state of Washington. Energy Northwest comprises 27 member utilities from across the state of Washington and is governed by two boards: a Board of Directors and an Executive Board. The Board of Directors includes representatives from member utilities, while the Executive Board includes representatives from member utilities, gubernatorial appointees, and public representatives selected by the Board of Directors. Energy Northwest is exempt from federal income tax. Energy Northwest has no taxing authority. Energy Northwest is not owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government.

The names and business addresses of Energy Northwest's directors and principal officers, all of whom are citizens of the United States, are as follows:

Executive Board Members and Officers

Sid Morrison, Chairman
Retired Executive
1001 Cooper Point Road
Suite 140-305
Olympia, WA 98502

Tom Casey, Vice Chairman
Grays Harbor County PUD Commissioner
2720 Sumner Avenue
P.O. Box 480
Aberdeen, WA 98520

David Remington, Secretary
Retired Energy Industry Executive
6711 South Highland Park Drive
Spokane, WA 99223

Kathleen Vaughn, Assistant Secretary
Snohomish County PUD Commissioner
2320 California Street
P.O. Box 1107
Everett, WA 98201

Edward E. (Ted) Coates
Retired Utility Executive
4604 North Lexington
Tacoma, WA 98407

K. C. Golden
Policy Director, Climate Solutions
1402 Third Avenue, Suite 1305
Seattle, WA 98101

Executive Board Members and Officers (continued)

Bill Gordon
Franklin County PUD
Commissioner
1411 West Clark
P.O. Box 2407
Pasco, WA 99302

Dan Gunkel
Klickitat County PUD Commissioner
1313 South Columbus
Goldendale, WA 98620

Jack Janda
Mason County PUD No. 1
Commissioner
N21971 Highway 101
Shelton, WA 98584

Lawrence Kenney
Retired Organized Labor Executive
5001 NE 90th Place
Seattle, WA 98115

Tim Sheldon
Washington State Senator
P.O. Box 40435
Olympia, WA 98504

Board of Directors Members and Officers

Judy Ridge, President
Commissioner, Asotin County PUD
1500 Scenic Way
P.O. Box 605
Clarkston, WA 99403

Larry Reese, Vice President
Commissioner, Wahkiakum County PUD
P.O. Box 248
Cathlamet, WA 98612

Lori Sanders, Secretary
Commissioner, Benton County PUD
2721 West 10th Avenue
P.O. Box 6270
Kennewick, WA 99336

Bill Gordon *, Assistant Secretary
Commissioner, Franklin County PUD
1411 West Clark
P.O. Box 2407
Pasco, WA 99302

Tom Casey *
Commissioner, Grays Harbor
County PUD
2720 Sumner Avenue
P.O. Box 480
Aberdeen, WA 98520

Ann Congdon
Commissioner, Chelan County PUD
327 North Wenatchee Avenue
P.O. Box 1231
Wenatchee, WA 98807

Board of Directors Members and Officers (continued)

Carol Curtis
Commissioner, Clark County PUD
1200 Fort Vancouver Way
P.O. Box 8900
Vancouver, WA 99668

Larry Dunbar
Deputy Director of Power Systems,
City of Port Angeles
321 East Fifth Street
P.O. Box 1150
Port Angeles, WA 98362

William A. Gaines
Director of Utilities,
Tacoma Public Utilities
3628 South 35th
P.O. Box 11007
Tacoma, WA 98411

Linda R. Gott
Commissioner, Mason County PUD No. 3
307 Cota Street
P.O. Box 2148
Shelton, WA 98584

Dan Gunkel *
Commissioner, Klickitat County PUD
1313 South Columbus
Goldendale, WA 98620

Greg Hansen
Commissioner, Grant County PUD
30 “C” Street SW
P.O. Box 878
Ephrata, WA 98823

Jack Janda *
Commissioner, Mason County PUD No. 1
N21971 Highway 101
Shelton, WA 98584

Steven Kern
Power Supply and Environmental Affairs Officer, Seattle City Light
700 Fifth Avenue
P.O. Box 34023
Seattle, WA 98124

Merritt Ketcham
Commissioner, Cowlitz County PUD No. 1
961 12th
P.O. Box 3007
Longview, WA 98632

Chris Kroupa
Commissioner, Ferry County PUD
686 South Clark Avenue
P.O. Box 1039
Republic, WA 99166

Board of Directors Members and Officers (continued)

Clyde Leach
Commissioner, Skamania County PUD
1492 Wind River Highway
P.O. Box 500
Carson, WA 98610

Ken McMillen
Commissioner, Jefferson County PUD
230 Chimacum Road
P.O. Box 929
Port Hadlock, WA 98339

Michael Murphy
Commissioner, Whatcom County PUD
1705 Trigg Road
Ferndale, WA 98248

Will Purser
Commissioner, Clallam County PUD
2431 East Highway 101
P.O. Box 1090
Port Angeles, WA 98362

Raymon Sieler
Energy Services Director,
City of Richland
840 Northgate
P.O. Box 190
Richland, WA 99352

Roger Sparks
Commissioner, Kittitas County PUD
1400 Vantage Highway
Ellensburg, WA 98926

Chuck TenPas
Commissioner, Lewis County PUD
321 NW Pacific Avenue
P.O. Box 330
Chehalis, WA 98532

Diana Thompson
Commissioner, Pacific County PUD No. 2
405 Duryea Street
P.O. Box 472
Raymond, WA 98577

Kathleen Vaughn *
Commissioner, Snohomish County PUD
2320 California Street
P.O. Box 1107
Everett, WA 98201

Ed Williams
Commissioner, City of Centralia
1100 North Tower Avenue
Centralia, WA 98531

David Womack
Commissioner, Okanogan County Public Utilities
1331 Second Avenue North
P.O. Box 912
Okanogan, WA 98840

* also serves on Executive Board

Senior Management Team

Vic Parrish Chief Executive Officer	Dale Atkinson Vice President, Operational Support
Jack Baker Vice President, Energy / Business Services	Sudesh Gambhir Vice President, Technical Services
Al Mouncer Vice President, Corporate Services / General Counsel / Chief Financial Officer	Scott Oxenford Vice President, Nuclear Generation and Chief Nuclear Officer

1.1.5 Class and Period of License Sought

Energy Northwest requests renewal of the Class 103 facility operating license for Columbia (facility operating license NPF-21) for a period of 20 years beyond the expiration of the current license term. License renewal would extend the facility operating license from midnight on December 20, 2023, to midnight on December 20, 2043.

This application also includes a request for renewal of the source material, special nuclear material, and by-product material licenses that are subsumed in or combined with the current facility operating license.

1.1.6 Alteration Schedule

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

1.1.7 Regulatory Agencies and Local News Publications

Regulatory agencies associated with electricity generated by Columbia:

Bonneville Power Administration
905 NE 11th Avenue
Portland, OR 97232

All electrical energy produced by Columbia is delivered to electrical distribution facilities owned and operated by Bonneville Power Administration (BPA) as part of the Federal Columbia River Power System. BPA in turn distributes the electricity to electric utility systems throughout the Northwest. BPA is obligated by law to establish rates for electric power that will recover the cost of electric energy acquired from Energy Northwest and other sources as well as BPA's other costs.

The following news publications are in circulation near the Columbia site and are appropriate to give reasonable notice of this application:

Tri-City Herald
333 West Canal Drive
Kennewick, WA 99336

Walla Walla Union-Bulletin
112 South First Avenue
Walla Walla, WA 99362

Yakima Herald-Republic
114 North Fourth Street
Yakima, WA 98901

1.1.8 Conforming Changes to Standard Indemnity Agreement

Per 10 CFR 54.19(b), license renewal applications are required to include "conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license." The current indemnity agreement (No. B-94) for Columbia 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).

Item 3 of the Attachment to the indemnity agreement, as revised by Amendment No. 1, lists Columbia operating license NPF-21. Energy Northwest requests that conforming changes be made to Article VII of the indemnity agreement, and Item 3 of the Attachment to that agreement, specifying the extension of agreement to the expiration date of the renewed Columbia facility operating license sought in this application.

In addition, should the license number be changed upon issuance of the renewal license, Energy Northwest requests that conforming changes be made to Item 3 of the Attachment to the indemnity agreement and to other sections of the agreement as deemed appropriate.

1.1.9 Restricted Data Agreement

This application does not contain any Restricted Data, Safeguards Information, or National Security Information. Energy Northwest does not expect that any activity or review requisite to issuance of the renewed license for Columbia will involve such information. However, if such information were to become involved, Energy Northwest agrees to 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 25 or 10 CFR 95, respectively.

1.2 DESCRIPTION OF COLUMBIA

The Columbia site encompasses approximately 1,089 acres. The site is located in Benton County on the Department of Energy's Hanford Site approximately 12 miles north of Richland, Washington.

The single unit plant is operated by Energy Northwest. The plant employs a boiling water reactor (BWR) nuclear steam supply system (NSSS) furnished by General Electric Company (GE). The reactor is licensed for a power output of 3486 megawatts-thermal (MWt). The gross electrical output of the plant is 1230 megawatts-electric (MWe).

Descriptive information about the plant systems and structures is provided in Section 2 of this application. Additional descriptions of Columbia systems and structures can be found in the Final Safety Analysis Report (FSAR).

[This page intentionally blank]

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

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

The scoping and screening methodology is described in Section 2.1. This methodology is implemented in accordance with NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule, Revision 6." The results of the assessment to identify systems and structures within the scope of license renewal (plant-level scoping) are provided in Section 2.2. The results of the identification of the structures and components subject to AMR (screening) are contained in the following sections:

- Section 2.3 for mechanical systems
- Section 2.4 for structures
- Section 2.5 for electrical and instrumentation and control systems

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

Table 2.0-1
Intended Functions: Abbreviations and Definitions

Intended Function	Abbreviation	Definition
Absorb Neutrons	ABN	Provide neutron absorption
Conduct Electricity	not abbreviated	Provide electrical connection to specified portions of an electrical circuit to deliver voltage, current, or signals
Direct Flow	DF	Provide spray shield or curbs for directing flow
Expansion or Separation	EXP	Provide for thermal expansion or seismic separation
Filtration	not abbreviated	Provide filtration to remove undesired contamination
Fire Barrier	FB	Provide rated fire barrier to confine or retard a fire from spreading to or from adjacent areas of the plant
Flood Barrier	FLB	Provide flood protection barrier (internal and external flooding event)
Floodable Volume	not abbreviated	Provide a floodable volume in which the core can be adequately cooled in the event of a break in a line external to the vessel
Flow Control	not abbreviated	Control or distribute flow as designed for balance or to promote mixing
Flow Distribution	not abbreviated	Condition the flow profile (e.g., evenly distribute) to ensure proper cooling
Gas Removal	not abbreviated	Remove air and noncondensible gases from a fluid environment or system
Gaseous Release Path	RP	Provide path for release of filtered and unfiltered gaseous discharge
Heat Sink	HS	Provide heat sink during station blackout or design basis accidents (includes source of cooling water for plant shutdown)
Heat Transfer	not abbreviated	Provide heat transfer capability
HELB Shielding	HELB	Provide shielding against high energy line breaks (HELB)

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

Intended Function	Abbreviation	Definition
Insulation	not abbreviated	To insulate and support an electrical conductor
Missile Barrier	MB	Provide missile barrier (internally or externally generated)
Pipe Whip Restraint	PW	Provide pipe whip restraint
Pressure Boundary	not abbreviated	Provide pressure retaining boundary so that sufficient flow at adequate pressure is delivered, or provide fission product barrier for containment pressure boundary, or provide containment isolation for fission product retention (*mechanical definition*)
Pressure Relief	PR	Provide over-pressure protection
Shelter or Protection	EN	Provide shelter or protection to safety-related equipment (includes HELB and radiation shielding)
Shielding	SHD	Provide shielding against radiation
Source of Cooling Water	SCW	Provides a source of cooling water for plant shutdown
Spray	not abbreviated	Introduce air, gas, or steam into a liquid (e.g., quencher, sparger), or liquid into air, gas, or steam (e.g., spray head or array, sprinkler), providing a defined flow pattern or flow distribution
Structural Integrity	not abbreviated	Maintain structural and pressure boundary integrity to prevent adverse physical interaction with safety-related SSCs such that the safety-related SSCs might fail to perform their intended functions
Structural Pressure Barrier	SPB	Provide pressure boundary or essentially leak tight barrier to protect public health and safety in the event of any postulated design basis events (*structural definition*)

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

Intended Function	Abbreviation	Definition
Support	not abbreviated	Provide structural integrity (e.g., reactor vessel support or internal subcomponents that do not have a pressure boundary function) (*mechanical definition*) Provide physical support for a conductor or electrical separation for conductors (*electrical definition*)
Support for Criterion (a)(1) Equipment	SSR	Provide structural or functional support to safety-related equipment
Support for Criterion (a)(2) Equipment	SNS	Provide structural or functional support to non-safety related equipment whose failure could prevent satisfactory accomplishment of required safety functions (includes Seismic II over I considerations)
Support for Criterion (a)(3) Equipment	SRE	Provide structural or functional support required to meet the Commission's regulations for any of the regulated events in 10 CFR 54.4(a)(3)
Throttling	not abbreviated	Provide flow restriction for measuring flow or for control to limit or balance flow
Water Removal	not abbreviated	Remove water from an air, gas, or ventilation environment to protect or improve the performance of downstream components

2.1 SCOPING AND SCREENING METHODOLOGY

The following sections describe the methodology used for the license renewal scoping (Section 2.1.1) and screening (Section 2.1.2) processes. A discussion of interim staff guidance as it applies to the Columbia license renewal process is contained in Section 2.1.3. Section 2.1.4 contains a review of Generic Safety Issues related to the Columbia license renewal process. Conclusions related to the scoping and screening methodology are provided in Section 2.1.5 and related references are contained in Section 2.1.6.

2.1.1 Scoping Methodology

The License Renewal Rule (10 CFR 54) defines the scope of license renewal using three criteria. 10 CFR 54.4(a) requires 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 Section 50.34(a)(1), Section 50.67(b)(2), or Section 100.11 of this chapter, as applicable.
2. All nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraphs (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).

In addition, 10 CFR 54.4(b) states:

> The intended functions that these systems, structures, and components must be shown to fulfill in Section 54.21 are those functions that are the bases for including them within the scope of license renewal as specified in paragraphs (a)(1) - (3) of this section.

NEI 95-10 (Reference 2.1-1) provides industry guidance for determining what plant SSCs are in the scope of license renewal. The process to determine the SSCs in the scope of license renewal for Columbia follows the recommendations of NEI 95-10.

The NRC endorsement of NEI 95-10, as stated in Section C.2 of Regulatory Guide 1.188, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses" (Reference 2.1-2), is:

> Revision 6 of NEI 95-10…provides methods that the NRC staff considers acceptable for complying with the requirements of 10 CFR Part 54 for preparing a license renewal application.

Consistent with NEI 95-10, the Columbia license renewal project scoping process establishes a listing of plant systems and structures, determines the functions they perform, and then determines which functions meet any one or more of the three criteria of 10 CFR 54.4(a). Functions that meet any one or more of the criteria are intended functions for license renewal. The systems or structures that perform those functions are included in the scope of license renewal.

The listing of Columbia mechanical and electrical systems was developed from

- the Maintenance Rule Scoping Matrix (MRSM)
- and the Final Safety Analysis Report (FSAR).

The listing of Columbia structures was developed from

- the MRSM,
- the FSAR,
- and from a review of civil-structural and plant layout drawings.

The information contained in the MRSM was a key input for the identification of system and structure functions because of the similarities in scoping requirements between the Maintenance Rule (10 CFR 50.65(b)) and the License Renewal Rule (10 CFR 54.4(a)).

The scoping process employed a combination of the following information sources to determine the system and structure license renewal intended functions:

- MRSM information,
- FSAR information,
- design basis and requirements documentation (e.g., design specifications, calculations, technical reports),
- analyses for post-fire safe shutdown, fire hazards, station blackout coping, environmental qualification, and anticipated transients without scram,
- the computerized database of Columbia equipment identification numbers (the Master Equipment List),

- flow diagrams,
- electrical drawings,
- civil and architectural arrangement drawings and site plans,
- docketed correspondence, including NRC safety evaluation reports,
- and other pertinent references, including the current licensing basis.

Each Columbia system and structure was evaluated against the criteria in 10 CFR 54.4(a) as described in the following sections. Additionally, since structural scoping was done independent of mechanical and electrical scoping, a review of mechanical and electrical scoping was performed to provide added assurance that structures that support or shelter in-scope mechanical and electrical components are included within the scope of license renewal.

- Section 2.1.1.1 describes the evaluation of the safety-related scoping criteria in 10 CFR 54.4(a)(1).
- Section 2.1.1.2 describes the evaluation of the non-safety affecting safety scoping criteria, 10 CFR 54.4(a)(2).
- Section 2.1.1.3 describes the evaluation of the regulated events scoping criteria, 10 CFR 54.4(a)(3).

The results of the scoping evaluations for plant systems and structures are presented in Section 2.2.

2.1.1.1 Safety-Related Scoping Criteria

As defined by 10 CFR 54.4(a)(1), all SSCs relied upon to remain functional during and following design basis events are evaluated as safety-related and are within the scope of license renewal.

Section 3.2.4 of the FSAR identifies the following quality assurance classifications used by Columbia:

- **Quality Class I** - Any nuclear system, structure, subassembly, component, or design characteristic that prevents or mitigates the consequences of postulated accidents that could cause undue risk to the health and safety of the public. All engineered safety features fall within this category. All Quality Class I items meet the applicable provisions of 10 CFR Part 50 Appendix B.

- **Quality Class II+** - Assigned to SSCs having no safety-related function but requiring quality augmentation either as a result of NRC requirements or as committed to by Columbia. Quality augmentation may include such requirements as environmental qualification, seismic qualification, or other quality affecting activities specifically committed. Augmented quality (AQ) applies to the following categories of SSCs:

1. Essential fire protection SSCs (reference FSAR Appendix F, Section F.5),
2. SSCs that do not perform a safety-related function but must be seismically supported and mounted (seismic 2-over-1) per Regulatory Guide 1.29,
3. SSCs required for radwaste management that are subject to Regulatory Guide 1.143,
4. SSCs required to cope with a station blackout per Regulatory Guide 1.155 (reference FSAR Appendix 8A),
5. SSCs required to respond to or mitigate anticipated transients without scram per the requirements of 10 CFR 50.62,
6. SSCs required to respond to an electrical separation safe shutdown event (reference FSAR Section 8.3.1.4.4.1.4),
7. Post-accident monitoring instruments subject to Regulatory Guide 1.97, Category 2, requirements, and
8. Remote shutdown items required in response to control room evacuation (10 CFR 50 Appendix A, GDC 19).

- **Quality Class II** - Any system, structure, subassembly, component, or design characteristic that could cause a safety hazard to plant personnel, an extended reduction in unit output, an unscheduled unit trip, or equipment damage.

- **Quality Class G** - Any non-nuclear system, structure, subassembly, component, or design characteristic to which quality assurance requirements are assigned in accordance with the consequences of failure, operating costs, or procurement costs.

Comparison of the FSAR quality assurance classifications to the criteria of 10 CFR 54.4(a)(1) shows that Columbia Quality Class I encompass the systems and equipment that meet the criteria of 10 CFR Part 54.4(a)(1). Quality Class II, II+, and G encompass the systems and equipment that meet the criteria of 10 CFR 54.4(a)(2) and 10 CFR 54(a)(3).

FSAR Table 3.2-1 provides a listing of major components and identifies the quality class for each component. Interfaces between components of different classifications are indicated by notes on the system flow diagrams contained in the FSAR. Safety-related piping and components identified on the system flow diagrams are designated as Quality Class I, which includes ASME Code, Section III, Class 1, 2, and 3 (reference FSAR Table 3.2-2 and Table 3.2-3).

Because of the similarities in the scoping requirements for the Maintenance Rule and the License Renewal Rule, the MRSM was the initial input for the identification of safety-related systems and structures, and their intended safety functions. The FSAR and its cited references identify the basis for the Columbia design basis events as well as describing the quality classification of the plant SSCs. Additionally, the Master Equipment List (MEL), which is a computerized database of Columbia equipment identification numbers and related component information that is searchable through PassPort, identifies safety-related components with an “SR” designation in the “Safety Class” field.

The above sources of information are reviewed to ensure that all systems that contain safety-related components are included in the scope of license renewal.

SSCs that perform intended functions that meet the safety-related criteria of 10 CFR 54.4(a)(1) are identified in Sections 2.3, 2.4, and 2.5.

2.1.1.2 Non-Safety Affecting Safety Scoping Criteria

10 CFR 54.4(a)(2) requires that non-safety related (NSR) SSCs whose failure could prevent satisfactory accomplishment of a safety function as defined in 10 CFR 54.4(a)(1), referred to as non-safety affecting safety (NSAS), be included in the scope of license renewal. In order to provide reasonable assurance that all such systems are identified, it is necessary to consider the impact of failures of NSR SSCs as either functional or spatial. Appendix F of NEI 95-10 contains guidance on scoping for NSAS. The Columbia methodology is consistent with this guidance.

For license renewal considerations, a functional NSAS failure is the failure of a NSR SSC to perform its normal function, which adversely affects the successful accomplishment of a safety function.

A spatial NSAS failure is the loss of structural or pressure boundary integrity of an NSR SSC that is connected to or located near (in physical proximity to) a safety-related SSC, which adversely affects the successful accomplishment of a safety function of the safety-related SSC.

The evaluation of functional failures and spatial failures with respect to license renewal is described further in the respective sections below.

2.1.1.2.1 Functional Failures of Non-safety Related SSCs

NSR SSCs that are credited to remain functional in support of a safety function, as defined in 10 CFR 54.4(a)(1), satisfy the NSAS license renewal scoping criteria of 10 CFR 54.4(a)(2).

The applicable sections of the FSAR, MRSM, and design basis requirements documents provide the system and structure functional information to address these considerations.

The SSCs that perform intended functions credited in the current licensing basis that meet the NSAS criteria of 10 CFR 54.4(a)(2) are identified in Sections 2.3, 2.4, and 2.5.

2.1.1.2.2 Spatial Failures of Non-safety Related SSCs

NSR systems and NSR portions of safety-related systems satisfy the NSAS scoping criterion if there is a potential for spatial interactions with safety-related equipment. That is, the degradation and failure of an NSR SSC that is directly connected to or located in the vicinity of safety-related SSCs creates the potential for interaction between the SSCs due to physical impact (including pipe whip, jet impingement, missiles), flooding, spray, or leakage that could adversely impact the safety-related function of a safety-related SSC. Spatial failures that meet the NSAS scoping criterion include both NSR SSCs in the general vicinity of, but not connected to, safety-related equipment, and NSR SSCs directly connected to safety-related SSCs (e.g., code breaks).

Certain mitigative features, such as missile barriers, flood barriers, and spray shields, are credited in the current licensing basis for the protection of safety-related SSCs from spatial interaction. These protective features are included in the scope of license renewal in accordance with Section 2.1.1.2.1 and are evaluated as structural components. In addition, the preventive option described in Appendix F of NEI 95-10 is used to determine the scope of license renewal with respect to the protection of safety-related SSCs from spatial interactions that are not addressed in the current licensing basis. The identification of NSR systems and portions of systems that are in the license renewal scope under 10 CFR 54.4(a)(2) due to a potential for spatial interactions with safety-related equipment requires an evaluation based on equipment location and the consequences of a NSR component failure in that location, rather than on equipment function itself. A conservative “spaces” approach is used in this identification process because it focuses on an entire structure (e.g., Reactor Building) rather than on specific limited areas within a structure. In this approach, all fluid-containing components (liquid or steam) and components associated with safety-related to NSR interfaces are evaluated for potential spatial interactions, with no rooms or areas or area-to-area transitions overlooked. For clarification, it should be noted that the Control Structure envelope, which is within the Radwaste Control Building, is evaluated as an “entire structure” for the purpose of this “spaces” approach.

Structural components (such as hangers, supports, conduit, cable trays, barriers, and other protective features) are included in the scope of license renewal if they are located in, or are a part of, a plant structure that contains systems or components that satisfy one or more of the license renewal scoping criteria (and distinction between safety-related and NSR structural components is not necessary). NSR mechanical systems and components are included in the scope of license renewal, due to the potential for spatial failures, if they are directly connected to or located in the same structure as safety-related systems and components, and if their failure would impact a safety function. Consistent with the related discussions in NEI 95-10 Appendix F, failure of NSR mechanical components that are not directly connected and do not contain a fluid (liquid or steam), will not result in spatial interaction as there is no fluid to leak, spray, or impinge on safety-related SSCs; and system pressure is such that there is no force that could cause significant movement of the failed component (e.g., pipe whip). This conclusion is confirmed by review of Columbia and industry operating experience.

For NSR piping that is directly connected to safety-related piping, the Seismic Category I design requirements are extended to the first seismic restraint beyond the defined boundaries. The seismic design is extended to the first point in the system that can be treated as an anchor to the plant structure. The NSR structural components in the scope of license renewal include those that comprise seismic anchors or equivalent anchors. An equivalent anchor is comprised of at least two rigid supports in each of three orthogonal directions. Seismic and equivalent anchors, and the associated piping and components for safety-related to NSR interfaces, satisfy the NSAS criterion if their failure would impact an attached safety-related component. The seismic anchor approach and the use of base-mounted equipment and flexible connection options, including the entire length of piping connected on both ends to safety-related piping and components, follows the guidance in NEI 95-10 Appendix F. Components were not excluded from the scope of license renewal based on duration of exposure to conditions resulting from failures (such as leakage or spray). NSR mechanical components that satisfy the NSAS criterion for spatial considerations are determined by a review of the flow diagrams, which depict building demarcations and safety-related equipment, and the component data in the plant MEL database, which identifies component classification and location.

SSCs that perform intended functions for spatial considerations that meet the NSAS criteria of 10 CFR 54.4(a)(2) are identified in Sections 2.3 and 2.4.

2.1.1.3 Regulated Events Scoping Criteria

The scope of license renewal includes all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with NRC 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).

Plant engineering documents provide the technical basis for the SSCs that are required for compliance with one or more of the above NRC regulated events. SSCs required for compliance with one or more of these NRC regulated events are identified through a combined review of the pertinent CLB documents and engineering documents, including the FSAR, the post fire safe shutdown analysis (see Section 2.1.1.3.1), the station blackout coping analysis (see Section 2.1.1.3.5), and the applicable docketed correspondence between Energy Northwest (Columbia) and the NRC.

The augmented quality (AQ) classification in the MEL database for components that require quality augmentation either as a result of NRC requirements or as committed by Columbia, but otherwise have no safety-related function, provided an input for regulated event scoping. AQ components fall into Quality Class II+, as described in Section 2.1.1.1, and include components required for fire protection, anticipated transients without scram, and station blackout. The MRSM also identifies certain system functions as "AQ" if they are performed by components that meet the criteria for quality augmentation.

The evaluation method for each regulated event is described further below.

SSCs that perform intended functions that meet the regulated event criteria of 10 CFR 54.4(a)(3) are identified in Sections 2.3, 2.4, and 2.5.

2.1.1.3.1 Fire Protection (10 CFR 50.48)

Requirements for fire protection at nuclear plants are contained in 10 CFR 50.48, "Fire protection" and General Design Criterion 3 of Appendix A to Part 50. The CLB for the Columbia fire protection program is described in Appendix F of the FSAR, "Fire Protection Evaluation."

Facility Operating License Condition 2.c.14 allows changes to the approved fire protection program provided the ability to achieve and maintain post-fire safe shutdown (PFSS) is not adversely affected.

Columbia was licensed after January 1, 1979; and therefore, in accordance with 10 CFR 50.48(b), Appendix R is not a required regulation. However, commitments to Appendix R are maintained current in FSAR Table F.3-2. Appendix R Section III.O is not applicable to Columbia since Primary Containment is nitrogen-inerted (see FSAR Appendix F Section F.2.2.5).

Columbia has performed a PFSS analysis. The results are summarized in FSAR Section F.4.4.4, Fire Hazards Analysis, and demonstrate that a single postulated fire in any fire area will not affect the ability of the unit to be brought to and maintained in a cold shutdown condition.

FSAR Table F.3-1 summarizes the level of compliance with the commitments of Appendix A to Branch Technical Position (BTP) Auxiliary Power Conversion Systems Branch (APCSB) 9.5-1.

The operability, compensatory measures, and surveillance for essential fire protection systems are in Licensee Controlled Specification 1.10, Fire Protection.

Systems and structures required for compliance with 10 CFR 50.48, as well as the corresponding intended functions, are determined through a review of the Columbia CLB for fire protection. This determination includes both the features required for fire protection of safety-related equipment, and the SSCs included in, or which provide necessary support for, one or more of the safe shutdown paths credited for conformance with Appendix R.

Systems that contain equipment that performs functions required for fire protection of safety-related equipment meet the Fire Protection license renewal scoping criteria (10 CFR 54.4(a)(3)), as do the systems that contain equipment credited as part of, or that support credited systems in, one or more of the safe shutdown paths.

2.1.1.3.2 Environmental Qualification (10 CFR 50.49)

Electrical and mechanical systems, and thereby the components in those systems, relied upon in safety analyses or in plant evaluations to remain functional when exposed to conditions existing during and following design basis accidents, in accordance with 10 CFR 50.49, "Environmental qualification of electrical equipment important to safety for nuclear power plants," are within the scope of license renewal in accordance with 10 CFR 54.4(a)(3).

The electrical components at Columbia that are required to be environmentally qualified for a harsh environment, in accordance with 10 CFR 50.49, are identified in the MEL database as "EQ-Related." These electrical components, with certain exceptions (e.g., cables, terminal blocks, fuse blocks, and some fuses and relays that do not have component numbers), and mechanical components that receive electrical power or signals, are assigned to a system and have a component identification number in the MEL database. Thereby, the electrical components, and electrical portions of mechanical components, required to demonstrate compliance with 10 CFR 50.49 can be associated with a system. Systems that include environmentally qualified components satisfy the scoping criterion of 10 CFR 54.4(a)(3) and are in the scope of license renewal.

2.1.1.3.3 Pressurized Thermal Shock (10 CFR 50.61)

Pressurized thermal shock, as defined in 10 CFR 50.61, "Fracture toughness requirements for protection against pressurized thermal shock events," is an event or transient in a pressurized water reactor (PWR) that causes severe overcooling (thermal shock) concurrent with or followed by significant pressure in the reactor vessel.

Columbia is a boiling water reactor (BWR) design and the regulations for pressurized thermal shock are not applicable to a BWR. Therefore, 10 CFR 50.61 is not applicable and consideration of pressurized thermal shock as a scoping criteria is not required for Columbia license renewal.

2.1.1.3.4 Anticipated Transients Without Scram (10 CFR 50.62)

Regulation 10 CFR 50.62, “Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants,” 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. An ATWS is not a design basis event, but is an anticipated operational transient that is accompanied by a failure of the reactor trip portion of the Reactor Protection System (RPS) to shut down the reactor.

In January 1986, GE issued a Licensing Topical Report, NEDE-31096-P (Reference 2.1-3), which was prepared for the BWR Owners’ Group (BWROG) ATWS Implementation Alternatives Committee, to generically address the hardware aspects of meeting 10 CFR 50.62. Individual plants could reference portions or all of this report in their plant-specific licensing submittals required by 10 CFR 50.62, paragraph (c)(6).

In October 1986, the NRC issued a safety evaluation report (SER) for NEDE-31096-P (Reference 2.1-4) which evaluated the acceptability of the proposed conceptual designs to meet the requirements of 10 CFR 50.62. The SER found that NEDE-31096-P was acceptable for referencing subject to specific stipulations. Columbia referenced this topical report in support of the submittal for compliance with 10 CFR 50.62.

The Columbia response for 10 CFR 50.62 consisted of three elements: (1) standby liquid control system design, (2) ATWS-ARI (alternate rod insertion) system design, and (3) ATWS-RPT (reactor recirculation pump trip) system design. FSAR Section 15.8 addresses the Columbia evaluation of an ATWS event.

Systems and structures required for compliance with 10 CFR 50.62, as well as the corresponding intended functions, are determined through a review of the Columbia CLB. This determination includes the necessary support functions and other plant system functions that are credited in the ATWS analysis.

2.1.1.3.5 Station Blackout (10 CFR 50.63)

Regulation 10 CFR 50.63, "Loss of all alternating current power," requires that each light-water-cooled nuclear power plant be able to withstand and recover from a station blackout (SBO). An SBO event is defined as the loss of offsite and onsite alternating current (AC) electric power to the essential and non-essential switchgear buses. It does not include the loss of AC power fed from inverters powered by station batteries. Nuclear power plants are required to be capable of withstanding an SBO event and maintaining adequate reactor core cooling and appropriate containment integrity for an established coping period.

The evaluation for Columbia against the regulatory requirements in 10 CFR 50.63 is documented in Appendix 8A of the FSAR. The Columbia coping analysis for an SBO event demonstrates the capability of installed equipment to maintain core cooling and containment integrity.

The NRC review and acceptance of the Columbia SBO coping assessment submittal is documented in a Safety Evaluation Report (SER) dated December 30, 1991 (Reference 2.1-5), and its supplement dated June 26, 1992 (Reference 2.1-6).

The coping assessment identified the plant equipment necessary to maintain core cooling and containment integrity for the established four hour coping period (see FSAR Appendix 8A). The identified equipment is relied upon for compliance with 10 CFR 50.63.

An additional consideration for license renewal, based on NRC guidance, is that the systems and structures relied upon to restore the offsite AC power (including the plant system portion of the offsite power system) and onsite AC power for an SBO event be included within the scope of license renewal. This guidance is provided in NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants” (Reference 2.1-7), and Interim Staff Guidance letter LR-ISG-02, “Staff Guidance on Scoping of Equipment Relied on to Meet the Requirements of the Station Blackout (SBO) Rule (10 CFR 50.63) for License Renewal (10 CFR 54(a)(3))”.

Systems and structures required for compliance with 10 CFR 50.63, as well as the corresponding intended functions, are determined through a review of the Columbia CLB, considering the requirements of the License Renewal Rule, and the guidance provided in NUREG-1800 and LR-ISG-02. The Columbia evaluation boundary for SBO is addressed in Section 2.5.6.

2.1.1.4 Scoping Boundary Determination

Each of the plant systems and structures are evaluated, as described above, to determine those that meet one or more of the scoping criteria listed in 10 CFR 54.4(a), and to determine their system- or structure-level intended functions, as described in 10 CFR 54.4(b). The license renewal evaluation boundaries (scoping boundaries) identify those portions of the in-scope system that are necessary to ensure that the intended functions of the system will be performed. Components needed to support each of the system-level intended functions identified in the scoping process must be included within the evaluation boundaries.

2.1.1.4.1 Mechanical Systems

For mechanical systems, the evaluation boundaries are illustrated on system flow diagrams by highlighting the flow paths that are required for the system to perform the intended functions identified in Sections 2.1.1.1, 2.1.1.2, and 2.1.1.3 above. The evaluation boundaries associated with Class 1 components are highlighted in blue. The evaluation boundaries for non-Class 1 components that perform a function other than spatial interaction are highlighted in green. The evaluation boundaries for NSR components that are in scope for spatial considerations are highlighted in magenta (pink).

2.1.1.4.2 Structures

The evaluation boundary of an in-scope structure is the structure itself and the structural commodities within that structure unless noted otherwise.

2.1.1.4.3 Electrical and Instrumentation and Control Systems

The philosophy of electrical systems license renewal scoping is that all plant electrical commodity groups are included within the scope of license renewal. This approach does not prevent commodity groups or specific plant components from being eliminated from the license renewal scope during further review as the intended functions of commodity groups or specific components are examined.

To aid in this process, each of the plant electrical and instrumentation and control (I&C) systems is evaluated to determine those that do not meet one or more of the criteria listed in 10 CFR 54.4 - that is, those systems that will be scoped out if the criteria are not met. This process requires a general knowledge of the plant's operation, its CLB, and plant-specific engineering evaluations.

The scoping of electrical systems includes the Columbia plant electrical systems (e.g., electrical distribution), along with the I&C systems (e.g., Radiation Monitoring, Neutron Monitoring), and an evaluation of electrical components within mechanical systems required for a complete evaluation of the mechanical system.

2.1.2 Screening Methodology

Screening is the process for determining the structures and components that are subject to AMR. The requirement for screening is found in 10 CFR 54.21(a), which states:

> (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 for the period of extended operation.

NUREG-1800 and NEI 95-10, Appendix B are used as the basis for the identification of passive structures and components. Most passive structures and components are long-lived. Although the requirements for the IPA are the same for all systems and structures, in practice the screening process differed for each of the mechanical, structural, and electrical disciplines. The screening process for each discipline meets the requirements of 10 CFR 54.21(a) and is described below.

2.1.2.1 Screening of Mechanical Systems

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

2.1.2.1.1 Identifying Mechanical Components Subject to Aging Management Review

Within the evaluation boundaries, all passive, long-lived mechanical components that perform or support a system-intended function are subject to AMR.

In making the determination that a component is passive (i.e., the component intended function is performed without moving parts or a change in configuration or properties), it is not necessary to consider the piece parts of the component. For example, in the case of pumps, valves, fans and dampers, the pump casings, valve bodies, and fan and damper housings may perform the component intended function of maintaining system pressure boundary integrity, and therefore, would be subject to AMR, whereas the pump impeller, valve discs and stems, fan blades, and damper blades are moving parts and not subject to AMR. A list of typical passive components is contained in NEI 95-10, Appendix B.

A determination is made as to whether a component is long-lived or short-lived (i.e., subject to replacement based on a qualified life or specified time period). Long-lived components are subject to AMR. Components that are short-lived and subject to replacement programs are excluded from AMR. Replacement programs may be based on vendor recommendations, plant experience, or any means that establishes a specific service life, qualified life or replacement frequency under a controlled program. The specific replacement program for a component must be identified in order to exclude it from AMR. Components subject to refurbishment or replacement solely on the basis of condition (e.g., the component is replaced only if significant degradation is observed during a periodic inspection) are long-lived and require an AMR.

Consumables are addressed in the process for determining components subject to AMR. Consumables are, by definition, not long-lived components and include such items as packing, gaskets, component seals, o-rings, oil, grease, component filters, system filters, fire extinguishers, fire hoses, and air packs. The guidance provided in Table 4.1-2 of NEI 95-10 is used to disposition consumables for Columbia (refer to Section 2.1.2.4).

Grouping of Mechanical Components into Component Types

In order to streamline the AMR process, most of the mechanical components that are subject to AMR are grouped into component types with similar characteristics. For example, it is not necessary to perform the AMR on each and every valve within the system evaluation boundaries. Rather, the valves are grouped together according to their materials of fabrication or construction and the environment to which they are exposed. In this way, the AMR is conducted once for carbon steel exposed to raw water, for example, and the results are applied to all carbon steel valves within the system evaluation boundaries that are exposed to raw water.

Components and component types within the system evaluation boundaries are reviewed against the list contained in NEI 95-10, Appendix B, and those that are both passive and long-lived are identified as subject to AMR. Typically, major plant components such as pumps, tanks, and heat exchangers that may have unique design features or functions are identified separately, and may include a component identification number; whereas others (piping, valves, instrumentation, etc.) are grouped by component type.

2.1.2.1.2 Mechanical Component Intended Functions

Mechanical components are evaluated to determine their intended functions. The component intended function is the component-level function, such as “maintain pressure boundary integrity,” that supports the system-level function, such as “provide core cooling flow." The primary component intended function performed by mechanical components is to maintain pressure boundary integrity. For systems with heat exchangers, the function of heat transfer may also be performed. A limited number of components may have secondary functions such as filtration, flow control, spray, or throttling.

Table 2.0-1 provides definitions of intended functions identified in this application, including those used for mechanical components.

2.1.2.2 Screening of Structures

For each structure or building within the scope of license renewal, the screening process identifies those structural components and commodities that are subject to AMR. Section 2.4 presents the results for structures.

2.1.2.2.1 Identifying Structural Components Subject to Aging Management Review

In accordance with the License Renewal Rule, an in-scope structure (i.e., Auxiliary Building) contains inherently passive long-lived structural components and commodities. Those structural components and commodities that perform an intended function are identified as subject to AMR.

The screening process for structural components and commodities involves review of design and licensing basis documents (design basis documents, drawings, FSAR, etc.) to identify specific structural components and commodities that make up the structure. Structural components and commodities typically have no unique identifiers like those given to mechanical components and are therefore categorized into groups.

Structural components and commodities are categorized by commodity groups based on materials of construction. Once the structural commodity groups are identified within an in-scope structure or building (e.g., steel, concrete, fire barriers, elastomers), subdividing the commodity groups into discrete structural component types based on design (e.g., walls, floors and ceiling, fire doors, flood curbs, equipment supports, penetrations, foundations, personnel airlocks) is useful because the same component types may have different intended functions based on their application.

Grouping of Structural Components into Commodity Groups

Structural components and commodities that are attached to a structure or reside within a structure are categorized as: (1) component supports, or (2) other structural members.

The evaluation boundaries for mechanical component supports are established in accordance with rules governing inspection of component supports (i.e., ASME Section XI, Subsection IWF). Component support examination boundaries for integral and non-integral (i.e., mechanically attached) supports are defined in article IWF-1300, Figure IWF-1300-1. In general, the support boundary extends to the surface of the building structure, but does not include the building structure. Furthermore, the support boundary extends to include non-integral attachments to piping and equipment, but excludes integral attachments to the same. Component support evaluation boundaries for non ASME in-scope components include the structural component and the associated attachment to the building structure (e.g., structural component supports for HVAC ducts include HVAC duct support members, baseplate and anchorage).

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

Evaluation boundaries for other structural members that function 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 part of the structure.

2.1.2.2.2 Structural Commodity Intended Functions

Structural components and commodities are evaluated to determine their intended functions. The intended functions for structural commodities are based on guidance provided in NEI 95-10 and related industry documents for license renewal.

Table 2.0-1 provides definitions of intended functions identified in this application, including those used for structural commodities.

2.1.2.3 Screening of Electrical and Instrumentation and Control Systems

For each electrical system within the scope of license renewal, the screening process identifies those electrical components and commodities that are subject to AMR. Electrical components in mechanical systems that are within the scope of license renewal are addressed under the electrical screening process. Section 2.5 presents the results for electrical systems.

2.1.2.3.1 Identifying Electrical Commodities Subject to Aging Management Review

The electrical components and commodity types identified at Columbia are evaluated to determine if they are subject to AMR and to determine the materials of construction and the service conditions (the operating environments) of the equipment. The basic philosophy of the electrical component IPA process is that all electrical components are subject to an AMR unless they are scoped out at the system level or are screened out at the component level (by commodity group or by specific component). Based on the guidance of NEI 95-10, Appendix B, the electrical components are grouped by component type and are evaluated in their respective commodity groups. The commodity groups are segregated into those which are active (by function) and those which are passive (by function). Per the criteria of 10 CFR 54.21(a)(1)(i), only passive components are subject to AMR; therefore, active components are excluded from AMR. The electrical screening process also sets aside the components that are subject to replacement based on a qualified life or specified time period (such as those within the Columbia environmental qualification program) as allowed by 10 CFR 54.21(a)(1)(ii). The remaining electrical components (i.e., commodity groups) are subject to AMR.

2.1.2.3.2 Electrical Commodity Intended Functions

Electrical commodities are evaluated to determine their intended functions. The intended functions for electrical commodities are based on guidance provided in NEI 95-10.

Table 2.0-1 provides definitions of intended functions identified in this application, including those used for electrical commodities.

2.1.2.4 Treatment of Consumables

Consumables, as defined in Section 4.1 of NEI 95-10, comprise the following four categories: (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. Each category, as it applies to Columbia license renewal, is discussed below. An additional category of mechanical sealants is discussed under Section 2.1.2.4.2 based on similarity to structural sealants. Compressed gas cylinders are added to the discussion under Section 2.1.2.4.4 based on a similar justification to that used for fire extinguishers.

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

Packing, gaskets, component seals, and o-rings are treated as sub-components of pressure-retaining components (e.g., valves) and are evaluated based on guidelines described in Table 2.1-3 of NUREG-1800. These sub-components are not relied upon by ASME Section III for maintaining system pressure boundary. These sub-components are intended to provide leak-proof seals when components are mechanically joined together, but are not required to support the intended function of the parent component. Therefore, packing, gaskets, component seals, and o-rings are classified as consumables and are not subject to AMR.

2.1.2.4.2 Structural Sealants

Structural sealants perform an intended function without moving parts or change in configuration and are not typically replaced. Therefore, structural sealants are subject to AMR based on their application.

Mechanical sealants used in heating, ventilation, and air-conditioning (HVAC) systems or other systems that circulate or process ambient air (e.g., standby gas treatment) similarly perform an intended function and are not typically replaced. Therefore, mechanical sealants in HVAC and other air circulation systems are subject to AMR based on their application.

2.1.2.4.3 Oil, Grease, and Component Filters

Oil, grease, and component filter media are sub-components and are by definition short-lived because either: (1) a program for periodic replacement exists, or (2) a monitoring program (e.g., predictive analysis activities, condition monitoring) exists that replaces these consumables, based on established performance criteria, when their condition begins to degrade, but before there is a loss of intended function. Examples of component filter media are fuel oil and lube oil filters. Therefore, oil, grease, and component filters are classified as consumables and are not subject to AMR.

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

System filter media, fire extinguishers, fire hoses, air packs, and compressed gas cylinders that are periodically inspected and replaced are short-lived and not subject to AMR. Examples of system filter media are the standby gas treatment charcoal filters and air intake filters for diesel generators or HVAC systems. The applicable standards that address inspection and replacement, such as National Fire Protection Association (NFPA) standards for fire protection equipment or Department of Transportation standards for gas cylinders, are credited for these components. Therefore, system filters, fire extinguishers, fire hoses, and air packs may be classified as consumables and are not subject to AMR if they are subject to periodic inspection and replacement.

2.1.2.5 Treatment of Stored Equipment

Equipment that is stored on-site for installation in response to a design basis event is evaluated as within the scope of license renewal. The FSAR and design criteria documents were reviewed to identify stored equipment by performing key word searches (e.g., stored, staged, replace, install, warehouse). Keyword searches of emergency operation and abnormal condition procedures and relevant portions of the plant procedures manual were performed to determine if there is stored or staged equipment that is relied upon (credited) in response to design basis events.

In the case of Columbia post-fire safe shutdown (cold shutdown), an explicit statement is included in Section F.4.3 of the FSAR, indicating that there are no actions (repairs) taken by plant staff to bring back into service a piece of equipment that has failed due to fire conditions and is necessary for post-fire safe shutdown. Therefore, there is no pre-staging of replacement parts for PFSS. The review of emergency operation and abnormal condition procedures did not identify any instances of a long-lived component being relied upon (credited) for design basis event mitigation. Therefore, there is no stored equipment subject to AMR.

2.1.2.6 Treatment of Insulation

Insulation is addressed in license renewal guidance documents, such as NEI 95-10, NUREG-1800, and NUREG-1801, “Generic Aging Lessons Learned (GALL) Report” (Reference 2.1-9), primarily in relation to electrical components (in terms of insulation for electrical cables, electrical connections, and electrical bus bar).

For electrical components, the insulation serves a specific function of protecting the conductor (preventing the unwanted loss of electrical current and conductivity). The thermal considerations of the insulation (if any) are secondary.

Mechanical and structural insulation provides insulating characteristics and protection for personnel and equipment for both safety-related and NSR mechanical components (e.g., piping and components that contain high or low temperature liquid or steam) and structural components. Mechanical and structural insulating materials may be credited with a specific function (such as in room heat-up analyses and structural fire barriers), or be affixed to mechanical components such that there is the potential to fall on, block, or obstruct safety-related components. As such, insulating materials are within the scope of license renewal if they limit heat transfer, serve as fire barriers, or must maintain their integrity to prevent interactions with safety-related components.

Insulation for electrical components, and for mechanical and structural applications, is passive and long-lived. Therefore, insulating materials that serve an intended function are subject to AMR.

2.1.3 Interim Staff Guidance Associated with License Renewal

Interim staff guidance associated with license renewal (LR-ISG) serve as a means for the staff to issue changes to license renewal guidance documents issued by the NRC between formal revisions. Changes are generally made with input from license renewal stakeholders. License renewal guidance documents issued by the NRC include NUREG-1800, NUREG-1801, and Regulatory Guide 1.188. LR-ISGs exist in either a draft or approved status. In general, LR-ISGs address technical rather than process issues.

Revision 1 of the LR-ISG process eliminated the “clarification” and “compliance” LR-ISG designations. As an alternative, the staff will document the basis for applicability of 10 CFR 54.37(b) or 10 CFR 50.109 in a new backfitting discussion section of each LR-ISG.

As recommended by NEI 95-10 (Section 1.4), which has been endorsed by the NRC, LR-ISGs that remain open and have not been incorporated into license renewal guidance documents should be evaluated by applicants for license renewal. The current status of LR-ISGs, as well as a description of the process, is available on the NRC Reactor License Renewal Guidance Document web page.

The LR-ISGs that remain open as of August 2009 are discussed below.

LR-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

This LR-ISG is under development. NEI and the Electric Power Research Institute Materials Reliability Program (EPRI-MRP) are to develop an augmented inspection program for NUREG-1801 aging management program (AMP) XI.M11-B, "Nickel-Alloy Base-Metal Components and Welds in the Reactor Coolant Pressure Boundary." This AMP will not be completed until after the NRC approves an augmented inspection program for nickel-alloy base metal components and welds as proposed by the ERPI-MRP. This issue will be concluded in the next NURG-1801 update and will not become an LR-ISG.

There is currently no affect on the Columbia License Renewal Application.

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

Plants with a BWR Mark I steel containment are to provide a plant-specific AMP that addresses the potential loss of material due to corrosion in the inaccessible areas of their Mark I steel containment drywell shell for the period of extended operation.

Columbia utilizes a Mark II containment design. Therefore, this ISG is not applicable to Columbia. However, the assessment of containment shell degradation from corrosion induced by a moist environment in the sand pocket region, and the associated preventative action of humidity measurements in the sand pocket region, have been incorporated into Columbia's current licensing basis since 1988. Columbia has committed to, and implemented, a procedure to survey the relative humidity of air drawn from within the containment annulus sand pocket region [Reference NRC Accession Number ML042530061]. Refer to Section 3.5.2.2.1.4 for additional information.

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

This LR-ISG endorses the use of industry guidance document NEI 05-01 (Revision A), issued in November 2005, when preparing severe accident mitigation alternatives (SAMA) analyses for License Renewal. The LR-ISG clarifies the staff's expectation with respect to SAMA information submitted with the LRA.

NEI 05-01 Revision A was used as guidance in the development of SAMA analyses submitted as part of the Columbia License Renewal Application.

LR-ISG-2007-01 – License Renewal Interim Staff Guidance Process, Revision 1

This LR-ISG issues a revised process for guiding the development and implementation of LR-ISGs. The revised process supersedes the previous process entitled, "Process for Interim Staff Guidance," which the NRC staff issued on December 12, 2003.

The LR-ISG process communicates interim changes to NRC license renewal guidance documents. Revision 1 of this LR-ISG extends the LR-ISG process to certain environmental review guidance documents, adds a new backfitting discussion section to LR-ISGs, and updates references to NRC license renewal guidance documents.

This LR-ISG does not affect the development of the Columbia License Renewal Application.

LR-ISG-2007-02 – Proposed Changes to Generic Aging Lesson Learned (GALL) Report Aging Management Program (AMP) XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"

The staff is proposing to revise NUREG-1801 AMP XI.E6 to recommend a one-time inspection prior to the period of extended operation for electrical cable connections not subject to 10 CFR 50.49 requirements instead of the periodic inspection currently stated in NUREG-1801 AMP XI.E6.

The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection for Columbia has been written as a one-time inspection to meet the anticipated changes to NUREG-1801 AMP XI.E6.

2.1.4 Generic Safety Issues

Generic resolution of a generic safety issue (GSI) or unresolved safety issue (USI) is not necessary for the issuance of a renewed license. GSIs and USIs that do not contain issues related to the license renewal AMR or time-limited aging evaluation need not be reviewed. Unresolved safety issues, and high and medium priority issues described in Appendix B of NUREG-0933, "Resolution of Generic Safety Issues" (Reference 2.1-8), that involve aging effects for structures and components subject to AMR or time-limited aging analyses are specifically addressed. Per NEI 95-10 (Section 1.5), the version of NUREG-0933 that is current on the date six (6) months before the submittal date of the LRA is used to identify such issues. Branch Technical Position (BTP) RLSB-2, Generic Safety Issues Related to Aging, contained in Appendix A.3 of NUREG-1800, provides additional guidance on treatment of GSIs.

Review of NUREG-0933 Appendix B identified no outstanding USIs. There are no GSIs identified as medium-priority. The following GSIs are identified as high-priority:

- GSI-163, Multiple Steam Generator Tube Leakage

- GSI-191, Assessment of Debris Accumulation on PWR Sump Performance (Revision 1)

GSI-163 and GSI-191 are applicable to a PWR design, per Appendix B to NUREG-0933. Since Columbia is a BWR design, these issues are generally not applicable. However, the NRC, by letter on April 10, 2008 to Richard Anderson, BWROG Executive Chairman, identified issues from GSI-191 related to the design of BWR ECCS strainers. The BWROG (and Columbia, as a participant) is engaged in a multi-year effort to address those issues.

There are no GSIs that require further evaluation in this License Renewal Application.

2.1.5 Conclusion

The methodology described in Sections 2.1.1 and 2.1.2 is used to identify the SSCs that are within the scope of license renewal and to identify those structures and components requiring AMR. 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 for Section 2.1

2.1-1 NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule*, Nuclear Energy Institute, Revision 6.

2.1-2 Regulatory Guide 1.188, *Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses*, U. S. Nuclear Regulatory Commission, Revision 1.

2.1-3 General Electric Report NEDE-31096-P, “ATWS Response to NRC ATWS Rule, 10 CFR 50.62”, January 1986. [referenced in FSAR Section 7.4.3]

2.1-4 Letter, NRC to BWR Owners’ Group, “Acceptance for Referencing of NEDE-31096-P (Enclosure: Safety Evaluation of Topical Report, NEDE-31096-P)”, October 21, 1986.

2.1-5 NRC Letter, GI2-92-012, P. L. Eng to G. C. Sorensen, “Safety Evaluation of the Washington Public Power Supply System Nuclear Project Number 2 Station Blackout Analysis (TAC No. M68626),” December 30, 1991.

2.1-6 NRC Letter, GI2-92-180, R. R. Assa to G. C. Sorensen, “Supplemental Safety Evaluation (SSE) of the Washington Public Power Supply System Nuclear Project No. 2 (WNP-2) Station Blackout Analysis (TAC M68626),” June 26, 1992.

2.1-7 NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,* U. S. Nuclear Regulatory Commission, Revision 1.

2.1-8 NUREG-0933, Supplement 32, *Resolution of Generic Safety Issues*, U. S. Nuclear Regulatory Commission, July 2008.

2.1-9 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, U. S. Nuclear Regulatory Commission, Revision 1.

[This page intentionally blank]

2.2 PLANT-LEVEL SCOPING RESULTS

The Columbia license renewal review methodology consists of three distinct processes: scoping, screening, and AMR. This section provides the results of the scoping process described in Section 2.1.1.

Table 2.2-1, Table 2.2-2, and Table 2.2-3 provide the results of applying the license renewal scoping criteria to the mechanical systems, electrical and I&C systems, and structures, respectively. If a system or structure, in whole or in part, meets one or more of the license renewal scoping criteria, the system or structure is evaluated as within the scope of license renewal for Columbia. The tables include a reference to the section of the application that discusses the screening results for each system and structure within the scope of license renewal.

Table 2.2-1
License Renewal Scoping Results for Mechanical Systems

System Name	In Scope?	Screening Results Section
Air Removal	No	
ASME Section VIII Non Power Block Vessels	No	
Auxiliary Steam	Yes	2.3.4.1
Auxiliary Steam Blowdown Subsystem	No	
Backwash Air	No	
Bleed (Extraction) Steam	No	
Boiler Chemical Feed	No	
Breathing Air Supply	No	
Carbon Dioxide	No	
Chemical Feed	No	
Chemical Feed (Iron Injection)	No	
Chemical Feed (Zinc Injection)	No	
Chemistry Equipment (and Instruments)	No	
Chlorine	No	
Circulating Water	Yes	2.3.3.1
Circulating Water Blowdown	No	
Condensate (Auxiliary)	Yes	2.3.4.2
Condensate (Nuclear)	Yes	2.3.4.3
Condensate Processing Radioactive (Demineralizer)	Yes	2.3.3.2
Condenser Drains and Vents	No	
Containment Atmosphere Control	Yes	2.3.3.3
Containment Exhaust Purge	Yes	2.3.3.4
Containment Instrument Air	Yes	2.3.3.5
Containment Monitoring	Yes	2.3.3.6
Containment Nitrogen	Yes	2.3.3.7

Table 2.2-1
License Renewal Scoping Results for Mechanical Systems (continued)

System Name	In Scope?	Screening Results Section
Containment Return Air	Yes	2.3.3.8
Containment Supply Purge	Yes	2.3.3.4
Containment Vacuum Breakers	Yes	2.3.3.9
Control Air	Yes	2.3.3.10
Control Rod Drive	Yes	2.3.3.11
Control Room Chilled Water	Yes	2.3.3.12
Cooling Jacket Water	No	
Cooling Tower Electrical Building Mixed Air	No	
CRD Decontamination	No	
Demineralized Water	Yes	2.3.3.13
Diesel (Engine) Exhaust	Yes	2.3.3.16
Diesel Building Exhaust Air	Yes	2.3.3.14
Diesel Building Mixed Air	Yes	2.3.3.14
Diesel Building Outside Air	Yes	2.3.3.14
Diesel Building Return Air	Yes	2.3.3.14
Diesel Cooling Water	Yes	2.3.3.15
Diesel Engine Starting Air	Yes	2.3.3.17
Diesel Fuel Oil	Yes	2.3.3.18
Diesel Generator	Yes	2.3.3.19
Diesel Lubricating Oil	Yes	2.3.3.20
Digital Electro-Hydraulic (Control) Fluid	No	
Equipment Drains Radioactive	Yes	2.3.3.21
Exhaust Steam (Turbine)	No	
Facilities Generic Equipment	No	
Filtered Water	No	
Fire Protection	Yes	2.3.3.22
Floor Drain	Yes	2.3.3.23

Table 2.2-1
License Renewal Scoping Results for Mechanical Systems (continued)

System Name	In Scope?	Screening Results Section
Floor Drain Radioactive	Yes	2.3.3.24
Fuel Oil	Yes	2.3.3.18
Fuel Pool Cooling	Yes	2.3.3.25
Glycol	No	
Guard House Exhaust Air	No	
Guard House Fire Protection	No	
Guard House Mixed Air	No	
Guard House Outside Air	No	
Guard House Potable Hot Water	No	
Guard House Return Air	No	
Heater Drain	No	
Heater Vents	No	
Heating Hot Water	No	
Heating Steam	No	
Heating Steam Condensate	No	
Heating Steam Vent	No	
High-Pressure Core Spray	Yes	2.3.2.3
Hydrogen	No	
Hydrogen Water Chemistry	No	
Independent Spent Fuel Storage Installation	No	
Instrument Rack	Yes	2.3.3.40
Isophase Bus Duct Cooling	No	
Laboratory Equipment (Permanent Plant)	No	
Leak Detection	Yes	2.3.3.26
Local Power Range Monitor	Yes	2.3.1.2
Low-Pressure Core Spray	Yes	2.3.2.4
Machine Shop Equipment	No	
Main Steam	Yes	2.3.4.4

Table 2.2-1
License Renewal Scoping Results for Mechanical Systems (continued)

System Name	In Scope?	Screening Results Section
Main Steam Leakage Control	Yes	2.3.4.5
Material Transport	No	
Mechanical Maintenance Equipment	No	
Miscellaneous Drain	Yes	2.3.4.6
Miscellaneous Waste	No	
Miscellaneous Waste Radioactive	Yes	2.3.3.27
Mobile Laundry Facility	No	
Nuclear Fuel Assemblies	Yes	2.3.1.2
Nuclear Steam Supply System	No	
Nuclear System Servicing Equipment	No	
Off Gas	No	
Offsite Facility Exhaust Air	No	
Offsite Facility Mixed Air	No	
Offsite Facility Outside Air	No	
Offsite Facility Recirculation Air	No	
Plant Sanitary Drains	Yes	2.3.3.28
Plant Service Water	Yes	2.3.3.29
Potable Cold Water	Yes	2.3.3.30
Potable Hot Water	Yes	2.3.3.31
Primary Containment (mechanical portions)	Yes	2.3.3.32
Process Sampling	Yes	2.3.3.33
Process Sampling Radioactive	Yes	2.3.3.34
Process Vents Radioactive	No	
Process Waste Radioactive	No	
Pumphouse Exhaust Air	Yes	2.3.3.35
Pumphouse Mixed Air	Yes	2.3.3.35
Pumphouse Outside Air	Yes	2.3.3.35
Pumphouse Return Air	Yes	2.3.3.35

Table 2.2-1 License Renewal Scoping Results for Mechanical Systems (continued)		
System Name	**In Scope?**	**Screening Results Section**
Radwaste Building Chilled Water	Yes	2.3.3.36
Radwaste Building Exhaust Air	Yes	2.3.3.37
Radwaste Building Heating Condensate	No	
Radwaste Building Mixed Air	Yes	2.3.3.37
Radwaste Building Outside Air	Yes	2.3.3.37
Radwaste Building Potable Hot Water	No	
Radwaste Building Refrigeration	No	
Radwaste Building Return Air	Yes	2.3.3.37
Reactor Building Exhaust Air	Yes	2.3.3.38
Reactor Building Outside Air	Yes	2.3.3.38
Reactor Building Potable Hot Water	No	
Reactor Building Return Air (Emergency Cooling)	Yes	2.3.3.38
Reactor Closed Cooling Water	Yes	2.3.3.39
Reactor Core Isolation Cooling	Yes	2.3.2.2
Reactor Feedwater	Yes	2.3.4.7
Reactor Feedwater Turbine	No	
Reactor Protection System	Yes	2.3.3.40
Reactor Recirculation	Yes	2.3.1.3
Reactor Service Equipment	No	
Reactor Water Cleanup	Yes	2.3.3.41
Residual Heat Removal	Yes	2.3.2.1
Roof Drains	Yes	2.3.3.23
Reactor Recirculation Hydraulic Control	No	
Sampling	Yes	2.3.3.34
Seal Oil	No	
Sealing Steam	No	
Service Air	Yes	2.3.3.42
Service Building Chilled Water	No	

Table 2.2-1
License Renewal Scoping Results for Mechanical Systems (continued)

System Name	In Scope?	Screening Results Section
Service Building Exhaust Air	No	
Service Building Heating Condensate	No	
Service Building Heating Hot Water	No	
Service Building Mixed Air	No	
Service Building Potable Hot Water	No	
Service Building Return Air	No	
Service Water Chemical Feed	No	
Solid Waste	No	
Spray Pond Filtration	No	
Standby Gas Treatment	Yes	2.3.2.5
Standby Liquid Control	Yes	2.3.3.43
Standby Service Water	Yes	2.3.3.44
Stator Cooling Water	No	
Sulfuric Acid Treatment	No	
Suppression Pool Temperature Monitoring	Yes	2.3.3.45
Technical Support Center Exhaust Air	No	
Technical Support Center Mixed Air	No	
Technical Support Center Outside Air	No	
Technical Support Center Potable Water	No	
Technical Support Center Refrigeration Equipment	No	
Technical Support Center Return Air	No	
Tower Makeup Water	Yes	2.3.3.46
Traversing Incore Probe	Yes	2.3.3.47
Turbine Building Exhaust Air	No	
Turbine Building Outside Air	No	
Turbine Building Potable Hot Water	No	
Turbine Building Return Air	No	
Turbine Generator	No	

Table 2.2-1
License Renewal Scoping Results for Mechanical Systems (continued)

System Name	In Scope?	Screening Results Section
Turbine Lube Oil	No	
Variable (Adjustable) Speed Drive Building Mixed Air	No	

Table 2.2-2
License Renewal Scoping Results for Electrical and I&C Systems

System Name	In Scope?	Screening Results Section
115kV AC Electrical Distribution	Yes	2.5
120V AC Electrical Distribution	Yes	2.5
230kV AC Electrical Distribution	Yes	2.5
4160V AC Electrical Distribution	Yes	2.5
480V AC Electrical Distribution	Yes	2.5
500 & 25kV AC Electrical Distribution	No	
6.9kV AC Electrical Distribution	Yes	2.5
Alternate Rod Insertion	Yes	2.5
Annunciators	No	
Area Radiation Monitoring	No	
Average Power Range Monitors	Yes	2.5
Cathodic Protection	No	
Communications	Yes	2.5
Conductivity (Salinity) Monitoring	No	
DC Electrical Distribution (250V DC, 125V DC, 24V DC)	Yes	2.5
Electrical Grounding	Yes	2.5
Electrical Maintenance Equipment	No	
Emergency Lighting	Yes	2.5
Environmental Radiation Monitoring	No	
Heat Tracing	Yes	2.5
Intermediate Range Monitors	Yes	2.5
Local Power Range Monitors	Yes	2.5
Loose Parts Detection System	No	
Meteorological	No	

Table 2.2-2 License Renewal Scoping Results for Electrical and I&C Systems (continued)		
System Name	**In Scope?**	**Screening Results Section**
Obstruction Lighting	No	
Plant Data Information System	No	
Plant Process Computer	No	
Plant Security	No	
Plant Vibration Monitoring System	No	
Process Radiation Monitoring	Yes	2.5
Rad. Control Board	No	
Reactor Protection System	Yes	2.5
Rod Block Monitor	No	
Rod Position Indication System	No	
Rod Worth Minimizer	No	
Seismic Monitoring	No	
Source Range Monitoring	No	
Supervisory Control	Yes	2.5
Transient Data Acquisition System	No	
Uninterruptible Power	Yes	2.5
Wide Range Monitoring	No	

Table 2.2-3
License Renewal Scoping Results for Structures

Structure Name	In Scope?	Comments / Screening Results Section
Adjustable Speed Drive (ASD) Building	No	Building provides shelter and support for ASD electrical components and cables. The ASD building contains no safe shutdown equipment, or cables, or associated circuits, an ASD fire will not prevent safe shutdown. The adjacent Turbine building 3-hr fire rated wall will prevent fire spread into other plant areas. A design basis fire within Fire Area ASD will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage. Building construction is a commercial grade steel framed building installed on a concrete slab at grade.
Administrative/Procedure Control	No	Provides space and facilities for plant personnel. The Administrative/Procedure Control building is located adjacent of the Technical Engineering Center. It is a single-story facility of modular steel construction on a concrete slab at grade.
Bullet Resistant Enclosures (BRE)	No	Provide observation and weapon points for plant security force. Steel structure on concrete foundation.
C&MS/Commercial Engineering	No	Single story facility that provides shelter and facilities for personnel and equipment not involved with daily operation of the nuclear power block. The building construction is a commercial grade modular steel structure on a concrete slab at grade and is located west of the plant complex and outside of the protected area.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Circulating Water Basins	Yes	2.4.12.1
Circulating Water Pump House	Yes	2.4.4
Columbia Exchange/ UTS/ Sprint Telecommunications Building	No	Vendor building located outside and to the west of the protected area that houses telecommunications equipment. The building is a single story concrete structure with a concrete slab on grade.
Condensate Storage Tank (CST) Foundations and Retaining Area	Yes	2.4.12.2
Construction & Maintenance Services/ Record Management/ Conference/ Fitness for Duty/ Occupational Health & First Aid	No	Single story facility that provides space and facilities for personnel. The building construction is a commercial grade modular steel structure on a concrete slab at grade and is located outside of the protected area west of the power block complex.
Contractor Building	No	This building is part of the ISFSI complex and is not within the scope of license renewal. See ISFSI below.
Control Booth/ Security	No	Located at the firing (rifle) range to support firearms qualification of security force. The firing range is north of the plant outside of the protected area.
Cooling Tower Basins	Yes	2.4.12.3
Cooling Towers	No	Provides cooling water to the plant during normal operation. Failure of non-tornado resistant cooling towers due to tornado loads does not endanger Seismic Category I structures since the plant arrangement provides sufficient distance between the cooling towers and Seismic Category I structures.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Corrosive Storage	No	Building is a pre-fabricated steel enclosed storage unit on a structural steel member (channels) base that is an integral part of the construction. Building is installed on grade and located outside the protected area at the warehouse complex.
Craft Lunchroom	No	Building is located outside the protected area west of the power block complex and provides shelter and facilities for contractor craft supporting Columbia. The building is standard commercial mobile trailer (double wide) wood framed construction. No permanent foundation is provided.
Craft Trailer	No	Building is located outside the protected area northwest of the power block complex and provides shelter and facilities for contractor craft supporting Columbia. The building is standard commercial mobile trailer wood framed construction. No permanent foundation is provided.
Craft/ Contractor Trailer	No	Building is located outside the protected area northwest of the power block complex and provides shelter and facilities for contractor craft supporting Columbia. The building is standard commercial mobile trailer wood framed construction. No permanent foundation is provided.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Cryogenic Nitrogen Storage Tank CN-TK-1 foundation and supports	No	Provides initial condition for inerting containment atmosphere. The NSR cryogenic liquid nitrogen storage tank (CN-TK-1) located at the corner of the diesel generator building will not fail due to tornado wind loads. However, if the design-basis tornado missile were to strike the tank straight on near the top of the tank, it could be toppled. Toppling of the liquid nitrogen storage tank due to the impact of a tornado missile can cause the entire contents of the tank to be rapidly emptied in the vicinity of the inerting system skid. There is no safety-related equipment in the vicinity of the tank that would be affected by the cryogenic temperatures associated with liquid nitrogen. In addition, due to the turbulent mixing produced in close proximity to a tornado, no oxygen deficiency condition could be sustained outdoors at the diesel generator intake structures. Failure of non tornado-resistant structures and components will not affect the ability to shut down the reactor, the integrity of the Primary Containment or other Seismic Category I structures, the capability of the essential heat removal systems to perform their intended design functions, nor result in the release of radioactivity.
Dangerous Chemical Storage	No	Building is a pre-fabricated steel enclosed storage unit on a structural steel member (channels) base that is an integral part of the construction. Building is installed on grade and located outside the protected area at the warehouse complex.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Demineralized Water Softener Trailer (also known as (aka) Calgon Water Softener Trailer)	No	Building is located outside of the protected area north of the power block complex and provides purified water source for plant potable water. Vendor furnished and maintained trailer-mounted demineralizer provides the purified water to the demineralized water system using the potable water source.
Diesel Fuel Polishing Building (aka Diesel Generator Fuel Polisher Building)	Yes	2.4.12.4
Diesel Generator Building	Yes	2.4.5
Document Storage Vault	No	Building is located outside of the protected area and houses hard copies of documents related to Columbia. The vault is constructed of hollow block masonry units (interior) with metal decking exterior installed on a concrete slab at grade.
Duct banks, cable trenches, manholes, valve pits, electrical towers	Yes	2.4.12.9
Electrical Building #1 (Cooling Tower)	No	Houses one-half (one train) of the electrical and supervisory equipment related to cooling tower components (e.g., fan motors, lighting). The building is located adjacent to the cooling towers and circulating water pump house. The building is a commercial grade steel framed construction installed on a concrete slab at grade.
Electrical Building #2 (Cooling Tower)	No	Houses one-half (one train) of the electrical and supervisory equipment related to cooling tower components (e.g., fan motors, lighting). The building is located adjacent to the cooling towers and circulating water pump house. The building is a commercial grade steel framed construction installed on a concrete slab at grade.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Fabrication Building	No	Building provides shelter for plant equipment and is located south of the plant complex. The building is a modular steel panel structure located on a common concrete foundation with the fabrication storage structure. The concrete foundation is approximately 12 inches above grade.
Fabrication Storage	No	Building provides shelter for plant equipment and is located south of the plant complex. The building is a modular steel panel structure located on a common concrete foundation with the fabrication building. The concrete foundation is approximately 12 inches above grade.
Facilities Electrical – Substation High Voltage	No	Numerous substations located inside and outside the protected area to provide power to the outlying (non-power block) buildings. The equipment is typically installed on a concrete slab at grade with no structure around the equipment.
Facilities Electrical – Substation Low Voltage	No	Numerous substations located inside and outside the protected area to provide power to the outlying (non-power block) buildings. The equipment is typically installed on a concrete slab at grade with no structure around the equipment.
Fire Brigade Equipment Storage	No	Building is a commercial grade steel framed structure installed on a concrete slab at grade. The building is located outside the protected area north of the warehouse complex.
Fire Training Buildings	No	One fire training building is a commercial grade steel framed structure installed on a concrete slab at grade. The other fire training building is constructed of concrete masonry units on a concrete slab at grade. This building is the “burn” building for fire training. Both buildings are located outside the protected area north of the warehouse complex.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Fire Water Bladder Tank (FP-TK-110) Embankment	Yes	2.4.12.5
Fresh Air Intake Structure No. 1	Yes	2.4.6
Fresh Air Intake Structure No. 2	Yes	2.4.6
Gas Bottle Storage (Assorted Gases)	No	Building is a three sided, two bay steel framed structure installed on an elevated (approximately 2 feet 6 inches) concrete truck platform. The building is located outside the protected area in the warehouse complex.
Gas Bottle Storage (Hydrogen)	No	Building is a three sided reinforced concrete structure (with roof) around an elevated (approximately 3 feet) concrete platform. The building is located outside the protected area and north of the transformer yard.
Guard Booths	No	Wood framed mobile structures without a permanent foundation. The guard booth located inside the protected area at the southwest corner is not currently in use (spared). The guard booth located at the west gate (vehicle trap) inside the protected area is manned during prescribed hours.
Guardhouse and Security Checkpoint	No	Building provides shelter for plant security force personnel during vehicle inspections at the entrance to the security-defined owner controlled area and is adjacent to checkpoint building. Building is a pre-fabricated steel sided structure installed on a concrete foundation at grade.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Health Physics Access Point (aka Alternate Access Point)	No	Houses health physics equipment required for ingress and egress from the power block. Building is located within the protected area and attached to the north wall of the Technical Support Center. The building is a single story and commercial grade steel framed construction installed on a concrete slab at grade.
Hydrogen Storage and Supply Facility (HSSF)	Yes	2.4.12.6
Independent Spent Fuel Storage Installation (ISFSI)	No	Provides temporary on-site spent fuel dry storage. The ISFSI has no safety-related functions. The ISFSI is located immediately north-northwest of the plant. Confinement of all radioactive materials at the ISFSI is provided by the required use of NRC certified spent fuel storage casks listed in 10 CFR 72.214. The ISFSI storage cask system consists of an inner stainless steel multi-purpose canister (MPC) and an outer storage overpack. The outer storage overpack is fabricated from concrete and structural steel components that are classified as important to safety. The spent fuel loaded storage casks are located within the Energy Northwest ISFSI protected area, which is surrounded by a fence and topped with barbed wire. The Independent Spent Fuel Storage Installation (ISFSI) is constructed and operated separately in accordance with general license requirements of 10 CFR 72 and is not licensed under 10 CFR 50. Therefore, it is not within the scope of license renewal.
Insulator Shop	No	This building is a single story, commercial grade, steel framed structure installed on a concrete slab at grade. Building is located outside the protected area northwest of the plant complex.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
ISFSI Craft Trailer	No	The ISFSI craft trailer is part of the ISFSI complex and is not within the scope of license renewal. See ISFSI above.
ISFSI Equipment Storage Building	No	The ISFSI equipment storage building is part of the ISFSI complex and is not within the scope of license renewal. See ISFSI above.
ISFSI Transformer Building	No	The ISFSI transformer building is part of the ISFSI complex and is not within the scope of license renewal. See ISFSI above.
Low Level Radwaste Storage	No	Building is located outside the protected area in the "burrow pit" southwest of the cooling towers. The building is commercial grade steel framed construction.
Maintenance Training	No	Provides shelter and facilities for plant personnel and maintenance training. It is located at Kootenai complex, which is outside of the protected area to the southwest.
Makeup Water Pump House (aka Tower Makeup Water (TMU) Pump House)	Yes	2.4.7
Meteorological Tower	No	Provides support for meteorological instruments. The meteorological tower is located approximately one half mile west of the plant site. The tower is automated so that the only personnel at the tower are those required to make adjustments to the instruments or to perform repairs to the system. Steel tower with guy wires.
Meteorological Tower Buildings	No	These buildings are located at the base of the met tower outside the protected area to the west of the plant complex. These are commercial grade fabricated steel structures installed on a concrete slab at grade.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Miscellaneous Structures and Towers (Electrical)	No	Provide support for electrical components and cables. Steel towers on concrete foundations.
Mobile Fire Response Vehicle and Trailer	Yes	2.4.12.7
North Pumphouse – Water Storage Tank (Plant Support Facility)	No	Provides potable water for Kootenai complex and is located east of the Kootenai complex, which is outside and southwest of the protected area. Building is constructed of concrete masonry units on a concrete slab at grade.
Oil and Solvent Storage	No	Building is located outside the protected area at the warehouse complex. Building is a commercial grade steel framed structure installed on concrete slab on grade.
Outage, Non Destructive Examination (NDE), Security, NRC, Quality Control	No	Building provides shelter and facilities for plant personnel. The building is a two-story commercial grade steel framed building installed on a concrete slab at grade. The building is located within the protected area southeast of the power block complex.
Paint and Battery Storage	No	Building provides equipment and battery storage. The building is a wood sided structure on a concrete foundation slab at grade except that the front (north) end has a concrete platform (loading dock) provided. The building is located within the protected area south of the plant complex.
Paint Storage	No	Building is constructed of concrete masonry units on a concrete slab at grade. The building is located outside the protected area to the west side of the plant complex.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Painters and Materials Warehousing	No	Building provides shelter and facilities for plant personnel and components (parts) to be used in the plant. Building is a commercial grade steel framed structure with a concrete slab foundation at grade. The building is primarily a single story with a high roof (approximately 20 feet), but does have a partial loft area in the northwest corner with office space for plant personnel. This building is located within the protected area south of the plant complex.
Plant Engineering Center (PEC)	No	Provides shelter and facilities for plant personnel. Plant Engineering Center is located west of the Columbia turbine generator building outside of the protected area. It is a two-story, 100,000 square foot facility designed to house plant staff personnel. The building is a precast and cast-in-place concrete structure.
Plant Maintenance	No	This building provides shelter and facilities for Maintenance personnel and is located south of the power block complex inside the protected area. The building is a single story and of commercial grade steel framed construction installed on a concrete slab foundation at grade.
Plant Support Facility (PSF)/ Emergency Operations Facility (EOF)	No	Provides shelter and facilities for plant support personnel. The building is located at Kootenai complex, which is outside of the protected area to the southwest. The building is a two story concrete structure with the majority of the lower story below grade for shielding purposes during an emergency condition for the plant.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Primary Access Point (P.A.P) (Security)	No	Provides shelter and facilities for plant security force. Building is a two story precast and cast-in-place concrete structure with the lower floor below grade. The building is located on the east side of the protected area, but is no longer used to access the protected area.
Primary Containment	Yes	2.4.1
Protected Area Access Point (P.A.A.P)	No	Building provides shelter and facilities for plant security force to control plant access to the protected area. The building is a precast and cast-in-place concrete structure with a concrete foundation slab at grade. The building is located on west side of protected area.
Pumphouse #1	No	This structure is located north of the Fire Water Bladder Tank outside the protected area and provides shelter for equipment not directly tied to operation of the plant. The building is a commercial grade steel framed structure installed on a concrete slab at grade.
Pumphouse #2	No	This structure is located east of the Fire Water Bladder Tank outside the protected area and provides shelter for equipment not directly tied to operation of the plant. The building is a commercial grade steel framed structure installed on a concrete slab at grade.
Radwaste Control Building	Yes	2.4.8
Reactor Building	Yes	2.4.2
Refrigerant Storage Maintenance Department	No	Building provides shelter (storage) for the plant's refrigerant inventory and is located outside the protected area south of the spray ponds. The building is a commercial grade steel framed structure on a concrete foundation slab at grade.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Rigging Storage	No	The building is a commercial grade steel framed structure placed on a concrete slab at grade. The building is located outside the protected area and north of the transformer yard and provides rigging equipment storage.
Secondary Guardhouse I&C Security	No	Building provides shelter and facilities for plant craft though originally intended to be used by Security force and provide alternate access to protected area. Building is a single story precast and cast-in-place concrete structure on a concrete foundation slab at grade. Some interior walls are concrete masonry unit construction. The building is located inside the protected area near the west side vehicle gate.
Security	No	Building is located adjacent of the Technical Engineering Center inside the protected area and provides space and facilities for plant security force. Structure is single story commercial grade metal framed construction on a concrete foundation.
Security Checkpoint Building	No	Building provides space and facilities for plant security force at vehicle checkpoint at the entrance to the security-defined owner controlled area. Building is a single story concrete structure on a concrete foundation.
Security Training Facility	No	Located at the firing (rifle) range outside the protected area northeast of the plant complex. Buildings support firearms training of nuclear security officers. It is a pre-engineered building placed on a railroad tie foundation. The railroad ties are rock-bolted together and then to the soil underneath.
Service Building	Yes	2.4.9

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Sewage Treatment Plant Blower and Laboratory Building (aka Sewage Treatment Facility)	No	Building provides shelter for plant equipment required for treatment of sanitary waste. The building is a concrete masonry unit structure on a concrete foundation. The building is located outside the protected area to the southeast of the plant complex.
Site Contractor Fabrication Shop	No	Building provides shelter and facilities for craft, equipment and materials necessary for fabrication of components for plant modifications. The building is a commercial grade steel framed structure on a concrete foundation slab at grade. The building is located outside of the protected area north of the transformer yard.
South Pumphouse – Water Storage Tank (Plant Support Facility)	No	Provides potable water for Kootenai complex and is located east of the Kootenai complex, which is outside and southwest of the protected area. Building is constructed of concrete masonry units on a concrete slab at grade.
Spray Pond 1A	Yes	2.4.3
Spray Pond 1B	Yes	2.4.3
Standby Service Water Pump House 1A	Yes	2.4.3
Standby Service Water Pump House 1B	Yes	2.4.3
Station Blackout component foundations and structures in the yard (startup transformers TR-S, Backup Transformer TR-B, Ashe A809 Breaker, Oil Control Circuit Breaker (OCB) E-CB-TRB, and Ashe Relay House)	Yes	2.4.12.8

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Storage	No	Building is a standard single wide mobile trailer construction placed on concrete blocks. The building is located north of the transformer yard outside the protected area.
Storage - Facilities	No	Both buildings are pre-fabricated steel framed structure. The buildings are supported with structural steel members (cribbing) placed directly on soil. Buildings are located outside the protected area to the northwest of the plant complex.
Storage – Maintenance Department	No	Commercially available storage units. They are steel sided units with a structural steel (tube steel) base. These storage units sit on a common concrete pad at grade with paint department storage units and all four storage units (two for maintenance department and two for paint department) share a common fire protection header. These buildings are located within the protected area south of the plant complex.
Storage – Outage Equipment	No	Buildings are commercial grade steel framed structures installed on concrete slab on grade. Buildings are located in the lay down yard at the warehouse complex outside the east side of the protected area.
Storage – Paint Department	No	Commercially available storage units. They are steel sided units with a structural steel (tube steel) base. These storage units sit on a common concrete pad at grade with maintenance department storage units and all four storage units (two for maintenance department and two for paint department) share a common fire protection header. These buildings are located within the protected area south of the plant complex.
Storage (HAZ MAT) – Chemistry Department	No	Two prefabricated, self-enclosed (no foundation), lockable storage units and are located outside the protected area on the west side of the plant complex.

**Table 2.2-3
License Renewal Scoping Results for Structures (continued)**

Structure Name	In Scope?	Comments / Screening Results Section
Storage (Used Oil and HAZ MAT)	No	This structure is a prefabricated, self-enclosed (no foundation), lockable storage unit and is located outside the protected area on the west side of the plant complex.
Technical Engineering Center	No	This building is a single story, commercial grade, steel framed structure installed on a concrete slab at grade. The building is located south of the power block complex inside the protected area and provides shelter and facilities for personnel supporting the plant.
Technical Support Center	No	Building provides shelter and facilities for personnel in support of emergency response organization. The building is a single story reinforced concrete structure on a concrete foundation with some interior concrete masonry unit walls. The building is located within the protected area on west side of Radwaste Control Building.
Training Fire and Emergency Response	No	Building is a standard commercial wood framed mobile trailer construction and consists of multiple trailers linked together. Building is not attached to a permanent foundation. Location is outside the protected area north of the warehouse complex.
Training Flow Loop and Mock-Up Facility	No	This building provides shelter and facilities for personnel involved in Maintenance training. The building is located outside the protected area to the northwest of the power block complex. The building is commercial grade steel framed construction installed on a concrete slab at grade.
Turbine Generator Building (aka Turbine Building)	Yes	2.4.10

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In Scope?	Comments / Screening Results Section
Warehouses and Offices	No	Provide warehouse and office space for the plant, and are located at the Snake River Complex. Structures are single story commercial grade modular steel construction on concrete foundations.
Water Filtration Building	Yes	2.4.11
Weapons Cleaning Trailer – Rifle Range	No	Building is standard commercial mobile trailer construction. The structure is located outside the protected area at the rifle range to the north of the plant.
Women's Rest Room (Bone Yard)	No	Building is standard commercial mobile trailer (single wide) construction and is currently not in use, but being stored at the warehouse complex outside of the protected area.

[This page intentionally blank]

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

The determination of mechanical systems within the scope of license renewal is made through the application of the process described in Section 2.1. The results of the mechanical systems scoping review are in Section 2.2.

Section 2.1 also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements of 10 CFR 54.21(a)(1). The components that meet these screening requirements are identified in this section.

The screening results for mechanical systems consist of lists of components and component types that require AMR. Brief descriptions of mechanical systems within the scope of license renewal are provided as background information. Mechanical system-intended functions are described for in-scope systems.

The screening results are provided below in four sections:

Reactor Vessel, Internals, and Reactor Coolant Pressure Boundary (Section 2.3.1),

Engineered Safety Features Systems (Section 2.3.2),

Auxiliary Systems (Section 2.3.3), and

Steam and Power Conversion Systems (Section 2.3.4).

Supports for all in-scope piping are evaluated as structural commodities in Section 2.4.13.

2.3.1 Reactor Vessel, Internals, and Reactor Coolant Pressure Boundary

The reactor pressure vessel, reactor vessel internals, and the reactor coolant pressure boundary consist of components designed to contain and support the nuclear fuel, contain the reactor coolant, and transfer the heat produced in the reactor to the steam and power conversion systems for the production of electricity. The following systems are included in this section:

Reactor Pressure Vessel (Section 2.3.1.1)

Reactor Vessel Internals (Section 2.3.1.2)

Reactor Coolant Pressure Boundary (Section 2.3.1.3)

A brief system description, reason for scope determination, associated FSAR references, associated license renewal drawings, and components subject to AMR information is provided for each system.

2.3.1.1 Reactor Pressure Vessel

System Description

The reactor pressure vessel (RPV) was designed by General Electric Nuclear Energy Division and fabricated by Chicago Bridge and Iron Nuclear Company. As described in FSAR Section 5.3.3.1.1.1, and shown in FSAR Figure 5.3-5, the reactor vessel is a vertical, cylindrical pressure vessel of welded construction. The vessel was designed, fabricated, tested, inspected, and stamped in accordance with the ASME Code Section III, Nuclear Power Plant Components, Division 1 – 1971 Edition, with Addenda to and including Summer 1971. Design of the reactor vessel and its support system meets Seismic Category I equipment requirements.

The main subcomponents of the RPV are listed below, and then discussed in order.

- Vessel Shell, Heads, and Closure Flanges
- Nozzles, Safe Ends, Safe End Extensions, Flanges, Caps, and Thermal Sleeves
- Control Rod Drive (CRD) Penetrations (Housings and Stub Tubes)
- Incore Penetrations
- Reactor Vessel Internal Attachments
- Reactor Vessel External Attachments
- Reactor Vessel Supports (Skirt, Skirt Knuckle, Bearing Plate, and Stabilizer Brackets)
- Reactor Vessel Insulation
- Pressure Boundary Bolting

Vessel Shell, Heads, and Closure Flanges

The RPV is made of a cylindrical shell, bottom head, and top head. The upper head and the upper shell each have a forged flange welded to them for vessel closure.

The reactor vessel closure head (flange) is fastened to the reactor vessel shell flange by threaded studs and nuts. The lower end of each stud is installed in a thread hole in the vessel shell flange. A nut and washer are installed on the upper end of each stud. The vessel flanges are sealed with two concentric metal seal rings. To detect seal failure, a vent tap is located between the two seal rings. A monitor line is attached to the tap to provide an indication of leakage from the inner seal ring seal.

Nozzles, Safe Ends, Safe End Extensions, Flanges, Caps, and Thermal Sleeves

Reactor vessel nozzles are described in the FSAR Section 5.3.3.1.4.5. The recirculation inlet (N2) nozzles, feedwater inlet (N4) nozzles, core spray inlet nozzles

(N5 – low pressure and N16 - high pressure), and residual heat removal/low-pressure coolant injection (RHR/LPCI) (N6) nozzles all have thermal sleeves to protect the pressure vessel and nozzle forgings from sudden temperature transients.

The use of the pressure and liquid control nozzle (N11, also known as the standby liquid control and differential pressure (SLC/DP) nozzle) has been modified from the original design. The nozzle for the standby liquid control (SLC) pipe was designed to minimize thermal shock effects on the reactor vessel in the event of injection of cold SLC solution. However, the SLC injection pipe has been relocated to a nozzle on the high-pressure core spray injection line and no longer uses the old nozzle in the bottom head of the RPV. The old nozzle is still in service as the connection for pressure sensing below the core plate, but there is no flow through the nozzle under any operating condition.

Due to issues found at other BWR plants, the original equipment manufacturer (General Electric) incorporated design improvements to the feedwater nozzles and thermal sleeves during initial fabrication of the Columbia reactor vessel. The issue with the feedwater nozzles was thermal fatigue cracking, in part caused by leakage around the thermal sleeve due to vibration. The solution of the feedwater nozzle cracking problems involved several elements, including material selection and processing, nozzle clad elimination, and thermal sleeve and sparger redesign. No cladding was installed on the feedwater nozzles. The thermal sleeves were welded to the safe ends, leaving no clearance between the thermal sleeve and the safe end for possible leakage.

Nozzle and nozzle weld zones are unclad except for those low alloy steel nozzle forgings mating to stainless steel piping systems; which have safe ends made of stainless steel. These safe ends are welded to the nozzle forgings after the pressure vessel has been heat treated to avoid furnace sensitization of the stainless steel safe ends. In several cases safe end extensions were also welded to the safe ends. The material used is compatible with the material of the mating pipe.

The vessel top head nozzles (N7, N8, and N18) are provided with weld neck flanges and blind flanges.

The CRD hydraulic system return nozzle (N10) thermal sleeve was removed and the nozzle was capped.

<u>CRD Penetrations (Housings and Stub Tubes)</u>

The bottom head of the reactor vessel has 185 CRD penetrations. A partial penetration stub tube is located in each penetration inside the vessel, and welded to the vessel ID. A drive housing is welded to the stub tube. The drive is bolted to a flange at the bottom of the housing.

Incore Penetrations

There are 55 stainless steel incore monitor housings inserted in penetrations in the bottom head of the reactor vessel. Each housing is used for either a source range monitor, intermediate range monitor, or local power range monitor. Traversing incore probes travel in guide tubes in the center of the local power range monitor housings.

Reactor Vessel Internal Attachments

There are multiple internal attachments to the RPV for supporting various internal components. These internal attachments include the dryer holddown brackets, guide rod brackets, steam dryer support brackets, feedwater sparger brackets, core spray brackets, surveillance specimen brackets, shroud support, and jet pump riser support pads.

Reactor Vessel External Attachments

There are multiple external attachments to the RPV. In addition to the support skirt and stabilizer brackets discussed below, the external attachments include the top head lifting lugs, name plate pads, support for the refueling bellows, insulation support brackets, and thermocouple pads.

Reactor Vessel Supports (Skirt, Skirt Knuckle, Bearing Plate, and Stabilizer Brackets)

Vessel stabilizers are connected between the reactor vessel stabilizer brackets and the top of the shield wall surrounding the vessel. The Columbia vessel has six stabilizer brackets.

The reactor vessel is supported by a steel skirt. The top of the skirt (the knuckle) is welded to the bottom of the vessel. Steel anchor bolts set in the concrete support pedestal extend through a bearing plate and secure the flange of the reactor vessel support skirt to the bearing plate and thus to the support pedestal.

Reactor Vessel Insulation

Reactor vessel Insulation is discussed in Section 5.3.3.1.4.4 of the FSAR. The reactor vessel insulation is a combination of the stainless steel reflective type and stainless steel self-contained units with aluminum foil spaced inside the insulation panel. The insulation panels for the cylindrical shell of the vessel are self-supporting, with seismic restraints attached to the sacrificial shield wall. The insulation is designed to be removable over those portions of the vessel where in-service inspection is required. Reactor vessel bottom head insulation includes horizontal flat panels connected to a cylindrical shell covering the inside of the reactor vessel support skirt.

Pressure Boundary Bolting

The reactor vessel closure head is attached to the vessel using studs, nuts, and washers. The three nozzles on the head are flanged and bolted (studs and nuts) to allow removal of the connecting lines during head removal. Other pressure boundary bolting consists of capscrews and washers between the CRD mechanisms and the CRD housings, the incore dry tubes and the incore housings, and between the power range monitors and the incore housings.

Reason for Scope Determination

The RPV is within the scope of license renewal as a safety-related component. The RPV provides a barrier to radiation release, contains and supports the reactor core, internals, and coolant moderator, and provides a floodable volume in which the core can be adequately cooled in the event of a break in a line external to the vessel. These safety functions meet the scoping criteria of 10 CFR 54.4(a)(1).

All sub-components of the RPV are safety-related, and thus there are no NSR portions to adversely affect safety-related systems or components. Therefore, the RPV does not meet the scoping criteria of 10 CFR 54.4(a)(2).

The RPV is not relied upon to demonstrate compliance with, nor satisfy the 10 CFR 54.4(a)(3) scoping criteria for, any regulated event.

FSAR References

Section 5.3 of the FSAR describes the RPV.

License Renewal Drawings

There are no license renewal drawings that depict the evaluation boundaries for the RPV components within the scope of license renewal. As the reactor vessel is a single component, there is no piping and instrumentation diagram (P&ID) that displays the subcomponents in sufficient detail to highlight them for scoping boundaries.

The RPV evaluation boundary consists of the vessel shell, heads, closure flanges, vessel closure bolting, nozzles, safe ends, safe end extensions, nozzle caps, nozzle flanges (including blank flanges), thermal sleeves, incore penetrations (housings), internal attachments (including shroud support, jet pump riser support pads, core spray brackets, steam dryer holddown brackets, guide rod brackets, surveillance specimen brackets, steam dryer support brackets, and feedwater sparger brackets), stabilizer brackets, support skirt and bearing plate, CRD stub tubes and housings, and associated pressure boundary bolting.

Components Subject to AMR

The reactor vessel thermal insulation is not required for reactor vessel functions and is evaluated as a structural component in Section 2.4.1.

The support skirt bolting through the bearing plate into a concrete and steel pedestal is evaluated with the pedestal as a structural component in Section 2.4.1. The skirt flange is bolted through a bearing plate and anchored to a concrete and steel pedestal, which carries the load through the wetwell to the Reactor Building foundation slab.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components of the RPV are in the scope of license renewal, but are not subject to AMR:

- Top Head Lifting Lugs
- Name Plate Pads
- Thermocouple Pads
- Refueling Bellows Support
- O-rings and gaskets

The internal attachments provide support to their respective components and all of the internal attachments are subject to AMR. External attachments are subject to AMR if they are load bearing attachments connected to pressure retaining portions of the vessel.

The top head lifting lugs do not bear significant weight during power operation. The name plate pads and thermocouple pads bear insignificant weight. The refueling bellows support is connected to the outer surface of the vessel flange, beyond the pressure boundary. The top head lifting lugs, name plate pads, thermocouple pads, and refueling bellows support do not support the License Renewal intended functions of the reactor vessel and are not subject to AMR.

In addition, o-rings and gaskets are not designed for the life of the plant and are periodically replaced. The main closure flange o-rings are replaced every refueling outage.

Table 2.3.1-1 lists the component types that require AMR and their intended functions.

Table 3.1.2-1, Aging Management Review Results – Reactor Pressure Vessel, provides the results of the AMR.

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

Component Type	Intended Function (as defined in Table 2.0-1)
Shell and Heads	
RPV upper head (dome) RPV bottom head	Pressure Boundary
RPV shell - closure flanges (upper head, shell)	Pressure Boundary
RPV shell - shell rings	Pressure Boundary
RPV shell – beltline plates and beltline welds	Pressure Boundary
Nozzles, Safe Ends, Safe End Extensions, Flanges, Caps, and Thermal Sleeves	
Nozzles (N1 through N18)	Pressure Boundary
Safe ends (N1 through N6, N9, N10, N11, N16) and flanges (N7, N8, N18)	Pressure Boundary
Safe end extensions (N1, N2, N4, N5, N6, N16)	Pressure Boundary
Cap for Nozzle N10 (CRD hydraulic return line)	Pressure Boundary
Thermal sleeves (N2, N4, N5, N6, N11, N16) and coupling (N11)	Pressure Boundary
Attachments and Housings	
RPV stabilizer brackets	Support
RPV support skirt and knuckle RPV support skirt bearing plate	Support
RPV inside diameter (ID) attachments and welds (shroud support, jet pump riser support pads, core spray brackets, steam dryer holddown brackets, guide rod brackets, surveillance specimen brackets, steam dryer support brackets, feedwater sparger brackets)	Support
CRD penetration (stub tube)	Pressure Boundary
CRD penetration (housing)	Pressure Boundary
Incore penetrations (housing)	Pressure Boundary

Table 2.3.1-1: Reactor Pressure Vessel (continued)	
Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	
RPV closure bolting (studs, nuts, washers)	Pressure Boundary
Pressure boundary bolting	Pressure Boundary

2.3.1.2 Reactor Vessel Internals

System Description

The reactor vessel internals are discussed in FSAR Section 3.9.5. A general assembly drawing of the important reactor components is shown in FSAR Figure 5.3-5. The floodable inner volume and internal flow paths are shown in FSAR Figure 3.9-2.

The reactor vessel internals include the core support subcomponents and other reactor vessel internal components. The main subcomponents of the reactor vessel internal core supports are the control rod guide tubes, core plate and holddown bolts, fuel supports, shroud, shroud support, and top guide (including bolts and keepers). The other reactor vessel internals are the control rod guide tube thermal sleeves, core spray lines and spargers, differential pressure line, feedwater spargers, guide rods, incore dry tubes, incore guide tubes, jet pump assemblies and instrumentation, low-pressure coolant injection (LPCI) couplings, steam dryer, shroud head and steam separator assembly, surveillance sample holders, and vessel head spray line. The fuel assemblies and control rod assemblies are included with the reactor vessel internals.

Reason for Scope Determination

The reactor vessel internals are within the scope of license renewal as a safety-related system. Reactor vessel internals provide reactor coolant pressure boundary integrity, contain and support the reactor core, internals, and coolant moderator, provide a floodable volume in which the core can be adequately cooled in the event of a break in a line external to the vessel, provide emergency core cooling including spray cooling during a large break loss of coolant accident (LOCA) that uncovers the core, and maintain the vessel water level during a small break LOCA that does not depressurize the vessel. The function of the core spray piping inside the vessel is to distribute core spray over the entire core. The piping accomplishes this function by maintaining the pressure boundary (of the core spray) so that the flow is delivered to the spargers. The spargers have the function of distributing the flow over the core. The function of the LPCI couplings is to provide flow for low pressure core flooding. The function of the fuel is to provide active nuclear fuel and cladding. The function of the control rods is to provide emergency reactor shutdown. These safety functions meet the scoping criteria of 10 CFR 54.4(a)(1).

The steam dryer has a NSR function to maintain structural integrity, which meets the scoping criteria of 10 CFR 54.4(a)(2).

Due to its connection with the Standby Liquid Control System, the high-pressure core spray piping inside the vessel is credited for boron injection into the vessel in response to an Anticipated Transients Without Scram event. This function meets the scoping criteria of 10 CFR 54.4(a)(3).

FSAR References

Section 3.9.5 of the FSAR describes the reactor vessel internals.

License Renewal Drawings

There are no license renewal drawings that depict the evaluation boundaries for the reactor vessel internals components within the scope of license renewal because there are no piping and instrumentation diagrams (P&IDs) that display the subcomponents in sufficient detail to highlight them for scoping boundaries.

The reactor vessel internals evaluation boundary includes the core support subcomponents and other reactor vessel internal components.

The CRD housings and their associated bolting, the incore housings, the bolting that joins the incore dry tubes and LPRM assemblies to the incore housings, the shroud support ring pad and the shroud feet welded to the vessel, and the surveillance sample holder bracket attachments to the vessel are reviewed with the RPV in Section 2.3.1.1. The feedwater line nozzles, thermal sleeves, and brackets welded to the vessel are reviewed with the RPV. The core spray nozzle, thermal sleeve, and brackets attached to the vessel wall are reviewed with the RPV.

The jet pump instrumentation outside the vessel is evaluated as part of the reactor coolant pressure boundary in Section 2.3.1.3. The Class 1 components of the feedwater line outside the vessel are also evaluated as part of the reactor coolant pressure boundary (see Section 2.3.1.3).

Components Subject to AMR

The jet pump instrumentation inside the vessel, feedwater spargers inside the vessel, head spray line inside the vessel, differential pressure line inside the vessel, surveillance sample holders, shroud head and steam separator assembly, steam separator and steam dryer guide rods, and control rod guide tube thermal sleeves do not perform an intended function for license renewal and are not subject to AMR.

The fuel assemblies, control rod assemblies, and local power range monitor assemblies are short-lived components and not subject to AMR.

Table 2.3.1-2 lists the component types that require AMR and their intended functions.

Table 3.1.2-2, Aging Management Review Results – Reactor Vessel Internals, provides the results of the AMR.

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

Component Type	Intended Function (as defined in Table 2.0-1)
Core Support Components	
Control rod guide tubes (tubes and base)	Support
Core plate assembly (plate, holddown bolts)	Support
Fuel supports (orificed and peripheral)	Support
Shroud (upper shroud, central shroud, and lower shroud)	Floodable Volume
Shroud support (access hole covers)	Floodable Volume
Top guide (beams and rim, alignment pins, wedge blocks)	Support
Jet Pump Assemblies	
Non-cast parts Riser pipe Mixer beam Mixer bolts, pins and inserts, and sleeve Diffuser shell Diffuser tail pipe	Floodable Volume
Castings Riser transition piece Mixer throat Mixer adapter, bracket, wedge, and adjusting screw Diffuser collar	Floodable Volume
Other Reactor Vessel Internals Items	
Core spray lines (piping, spargers, clamps, and brackets)	Flow Distribution
Incore dry tubes	Pressure Boundary
Incore guide tubes	Support
LPCI couplings	Pressure Boundary
Steam dryer	Structural Integrity

2.3.1.3 Reactor Coolant Pressure Boundary

System Description

The reactor coolant pressure boundary consists of those systems and components that contain or transport fluids coming from, or going to, the reactor core. The reactor coolant pressure boundary evaluated for license renewal consists of the reactor vessel, the incore dry tubes and the local power range monitors (which are internal to the reactor vessel, but form part of the pressure boundary), supporting systems (e.g., CRD hydraulic and Reactor Recirculation), and those attached systems and components that form portions of the nuclear system process barrier. The RPV is discussed in detail in Section 2.3.1.1. The reactor vessel internals are discussed in detail in Section 2.3.1.2.

The reactor coolant pressure boundary as evaluated for license renewal includes the ASME Code Class 1 portions of the systems listed below. In addition, the in-scope portions of the Reactor Recirculation System are included in the reactor coolant pressure boundary for the purpose of license renewal evaluation.

As part of the reactor coolant pressure boundary, the following systems are addressed in this section. The non-Class 1 in-scope portions of the listed systems, except for the Reactor Recirculation System, are discussed in Sections 2.3.2, 2.3.3, and 2.3.4.

Control Rod Drive System (Class 1 portions only)

Low-Pressure Core Spray System (Class 1 portions only)

High-Pressure Core Spray System (Class 1 portions only)

Main Steam System (Class 1 portions only)

Reactor Core Isolation Cooling System (Class 1 portions only)

Reactor Feedwater System (Class 1 portions only)

Residual Heat Removal System (Class 1 portions only)

Reactor Recirculation System

Reactor Water Cleanup System (Class 1 portions only)

Standby Liquid Control System (Class 1 portions only)

The Reactor Recirculation System provides coolant flow through the core. The Reactor Recirculation System consists of the two recirculation pump loops external to the reactor vessel. These loops provide the piping path for the driving flow of water to the reactor vessel jet pumps. Each external loop contains one motor-driven recirculation pump. The Reactor Recirculation System is mainly within Primary Containment; however, the system has instrumentation lines that penetrate containment, with tubing, valves, and transmitters in the Reactor Building outside the Primary Containment.

Reason for Scope Determination

The reactor coolant pressure boundary provides a high integrity barrier against the leakage of radioactive materials and provides containment isolation via closure of containment isolation valves and excess flow check valves. The Reactor Recirculation System provides the capability to trip the recirculation pumps, provides isolation and integrity of the Primary Containment, and maintains the integrity of the reactor coolant pressure boundary. These system-intended functions are safety-related. Therefore, the reactor coolant pressure boundary meets the scoping criteria of 10 CFR 54.4(a)(1).

The Reactor Recirculation System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function.

The Reactor Recirculation System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the Reactor Recirculation System meets the scoping criteria of 10 CFR 54.4(a)(2).

The Reactor Recirculation System provides reactivity control in response to an anticipated transients without scram event by means of recirculation pump trip. The Reactor Recirculation System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) and Anticipated Transients Without Scram (10 CFR 50.62) regulated events.

FSAR References

Section 5.1 of the FSAR describes the reactor coolant pressure boundary and the reactor coolant system.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M519, LR-M520, LR-M521-1, LR-M521-2, LR-M521-3, LR-M522, LR-M523-1, LR-M528-1, LR-M529, LR-M530-1, LR-M557, LR-M607-1, LR-M896

Components Subject to AMR

Table 2.3.1-3 lists the component types that require AMR and their intended functions.

Table 3.1.2-3, Aging Management Review Results – Reactor Coolant Pressure Boundary, provides the results of the AMR.

The CRD mechanisms are specifically excluded from AMR by 10 CFR 54.21(a)(1)(i). The CRD housings attached to the reactor vessel are evaluated in Section 2.3.1.1.

The lines that provide CRD fluid seal injection flow to the reactor recirculation pumps are non-Class 1 lines, but they provide support to the Class 1 heat exchanger and therefore are subject to AMR. These lines are evaluated as part of the Reactor Recirculation System.

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

Component Type	Intended Function (as defined in Table 2.0-1)
Annubar	Pressure Boundary
Bolting	Pressure Boundary
Condensing unit	Pressure Boundary
Flow element	Pressure Boundary Throttling
Heat exchanger (recirculation pump seal cooler)	Pressure Boundary Heat Transfer
Orifice	Pressure Boundary Structural Integrity Throttling
Piping (Reactor Recirculation, non-safety affecting safety)	Structural Integrity
Piping and fittings (less than 4 inch) – RV flange leak off lines	Pressure Boundary
Piping and fittings (less than 4 inch)	Pressure Boundary
Piping and fittings (greater than or equal to 4 inch)	Pressure Boundary
Pump casing (recirculation pump)	Pressure Boundary
Pump stuffing box (recirculation pump)	Pressure Boundary
Pump motor flange (recirculation pump)	Pressure Boundary
Tubing	Pressure Boundary
Valve body (less than 4 inch)	Pressure Boundary
Valve body (greater than or equal to 4 inch)	Pressure Boundary
Valve body (Reactor Recirculation, non-safety affecting safety)	Structural Integrity

2.3.2 Engineered Safety Features

The engineered safety features (ESF) are those systems used to mitigate the consequences of postulated accidents. The systems provide containment, emergency core cooling, habitability, and fission product removal and control. The habitability systems and the mechanical systems associated with containment are discussed in Section 2.3.3. Combustible gas control as listed under containment systems is performed by the Residual Heat Removal System in containment spray mode. Primary containment is discussed in Section 2.4.1. Secondary containment as part of the Reactor Building is discussed in Section 2.4.2. The following systems, four of which are ESF systems for Columbia, are addressed in this section. The RCIC System, while not designated as an ESF system for Columbia, is included to allow comparison to systems treated in Chapter V of NUREG-1801, which deals with mechanically similar systems that do provide engineered safety functions.

Residual Heat Removal (RHR) System (Section 2.3.2.1)

Reactor Core Isolation Cooling (RCIC) System (Section 2.3.2.2)

High-Pressure Core Spray (HPCS) System (Section 2.3.2.3)

Low-Pressure Core Spray (LPCS) System (Section 2.3.2.4)

Standby Gas Treatment (SGT) System (Section 2.3.2.5)

The Core Spray systems are primarily addressed under the Emergency Core Cooling System (ECCS) heading. The ECCS is divided into three functional groups:

- HPCS
- LPCS
- RHR (operating in LPCI mode)

The Automatic Depressurization System (ADS), while designated as an ESF system for Columbia, is evaluated as part of the Main Steam System in Section 2.3.4.4 for the purpose of comparison to NUREG-1801.

A brief system description, reason for scope determination, associated FSAR references, associated license renewal drawings, and components subject to AMR information is provided for each system.

2.3.2.1 Residual Heat Removal (RHR) System

System Description

The RHR System is comprised of three independent loops. Each loop contains its own motor-driven pump, piping, valves, instrumentation, and controls. Each loop has a suction source from the suppression pool and is capable of discharging water to the RPV or back to the suppression pool. The A and B loops have heat exchangers that are cooled by the Standby Service Water System. Loops A and B can also take suction from the Reactor Recirculation System suction and can discharge into the reactor recirculation discharge or to the suppression pool and drywell spray spargers. Spool piece inter-ties are available to permit the RHR heat exchangers to be used to supplement the cooling capacity of the Fuel Pool Cooling System. These spool pieces are left in place and are administratively controlled. The A and B loops also have connections to the RCIC System steam line. However, these are not used because the steam condensing mode of RHR has been eliminated, as discussed below.

The RHR System is designed to restore and maintain the coolant inventory in the RPV and to provide primary system decay heat removal following reactor shutdown for both normal and post-accident conditions. The primary design operating modes associated with performing these functions are the LPCI mode, the suppression pool cooling and containment spray modes (including combustible gas control), the shutdown cooling mode, the alternate shutdown cooling mode, and the fuel pool cooling mode. The reactor steam condensing mode has been deactivated. No credit has been taken for the steam condensing mode in the safety analysis.

Reason for Scope Determination

The RHR System operates in the LPCI mode, the suppression pool cooling mode (includes support of safety-related alternate shutdown cooling), and the containment spray mode, and provides Primary Containment isolation and integrity, secondary containment isolation and integrity, and maintains the reactor coolant pressure boundary integrity. These system-intended functions are safety-related. Therefore, the RHR System meets the scoping criteria of 10 CFR 54.4(a)(1).

The RHR System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The RHR System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the RHR System meets the scoping criteria of 10 CFR 54.4(a)(2).

The RHR System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49), and Anticipated Transients Without Scram (10 CFR 50.62) regulated events.

FSAR References

Section 5.4.7 of the FSAR describes the RHR System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M520, LR-M521-1, LR-M521-2, LR-M521-3, LR-M521-4

Components Subject to AMR

Table 2.3.2-1 lists the component types that require AMR and their intended functions.

Table 3.2.2-1, Aging Management Review Results – Residual Heat Removal System, provides the results of the AMR.

The ASME Code Class 1 portions of the RHR System, from the RPV to and including the outboard containment isolation valves are evaluated with the reactor coolant pressure boundary (see Section 2.3.1.3). Also included in the reactor coolant pressure boundary evaluation are the ASME Code Class 1 portions of the process instrumentation piping out to and including the excess flow check valves.

Although the components in the deactivated steam condensing mode of the RHR System, and the deactivated control air supply to testable check valves, are classified as Quality Class I and safety-related, they have no safety function and for the purpose of AMR are evaluated as NSR.

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

Component Type	Intended Function (as defined in Table 2.0-1)
Actuator housing	Structural Integrity
Bolting	Pressure Boundary Structural Integrity
Flexible connection	Pressure Boundary
Heat exchanger (channel, cover, shell, tubesheet, and tube plug)	Pressure Boundary
Heat exchanger (tubes)	Heat Transfer Pressure Boundary
Orifice	Pressure Boundary Throttling
Piping	Pressure Boundary Structural Integrity
Pump casing (casing, column, shell)	Pressure Boundary
Separator	Flow Control Pressure Boundary
Spray nozzle	Pressure Boundary Spray
Strainer	Filtration
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.2.2 Reactor Core Isolation Cooling (RCIC) System

System Description

The RCIC System is not an ECCS nor an ESF system and no credit is taken in the accident analyses of FSAR Chapter 6 or Chapter 15 for its operation. However, the system is designed to initiate during plant transients that cause low reactor water level. Therefore, for the purposes of license renewal, the RCIC System is included with ECCS and ESF systems because of its similar functions and its contribution to the reduction of overall plant risk.

The RCIC System consists of a turbine, pump, piping, valves, accessories, and instrumentation designed to ensure that sufficient reactor water inventory is maintained in the reactor vessel to permit adequate core cooling. This function prevents reactor fuel overheating should the vessel be isolated and accompanied by loss-of-coolant flow from the Reactor Feedwater System.

In the event the reactor vessel is isolated and the feedwater supply is unavailable, relief valves are provided to automatically (or through remote manual operation to) maintain vessel pressure within desirable limits. In such an event, the water level in the reactor vessel will drop due to continued steam generation by decay heat.

On reaching a predetermined low level, the RCIC System is initiated automatically. The RCIC turbine is driven with a portion of the decay heat steam from the reactor and exhausts to the suppression pool. The turbine-driven pump takes suction from the condensate storage tank (CST) during normal modes of operation and injects into the reactor vessel. If the water supply from the CST becomes exhausted there is an automatic switchover to the suppression pool as the water source for the RCIC pump.

During RCIC operation, the suppression pool acts as the heat sink for the RCIC turbine exhaust and for steam generated by reactor decay heat that is released from the safety relief valves, which are components of the Main Steam System.

Reason for Scope Determination

The RCIC System provides water to the RPV when the vessel is isolated, provides Primary Containment isolation and integrity (including valve position indication), and maintains reactor coolant pressure boundary integrity. All of these system-intended functions are safety-related. Therefore, the RCIC System meets the scoping criteria of 10 CFR 54.4(a)(1).

The RCIC System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The RCIC System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the RCIC System meets the scoping criteria of 10 CFR 54.4(a)(2).

The RCIC System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) and Anticipated Transients Without Scram (10 CFR 50.62) regulated events.

FSAR References

Section 5.4.6 of the FSAR describes the RCIC System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M519

Components Subject to AMR

Table 2.3.2-2 lists the component types that require AMR and their intended functions.

Table 3.2.2-2, Aging Management Review Results – Reactor Core Isolation Cooling System, provides the results of the AMR.

The ASME Code Class 1 portions of the RCIC System, from the RPV to and including the outboard containment isolation valves and the ASME Code Class 1 portions of the process instrumentation (PI) piping out to and including the excess flow check valves are evaluated with the reactor coolant pressure boundary (see Section 2.3.1.3).

Although the components in the deactivated steam condensing mode of the RCIC System are classified as Quality Class I, they have no safety function and for the purposes of AMR are evaluated as NSR.

Filter media are evaluated as short-lived components (consumables) and are not subject to AMR. The filter housings have a pressure boundary function and are subject to AMR.

The RCIC vacuum tank strainer (RCIC-ST-4) is a NSR, non-pressure boundary component. The filtration function of the strainer is not required to support the RCIC system in meeting its safety or anticipated transients with scram functions; and it does not contribute to, nor will it prevent the RCIC System from meeting its design requirements. The strainer does not have a structural integrity function as an attached component. Therefore, the strainer is not subject to AMR.

Solenoid-operated three-way valves and the associated air lines provide a control air supply to the actuators for in-scope valves. However, a failure of the air supply places the valves in a safe position that supports the system function. Therefore, pressure-boundary integrity is not a required component intended function of these solenoid valves, air supply lines, or actuators for the system to perform its intended function. Since these components have no other component intended function, they are not subject to AMR.

Table 2.3.2-2
Reactor Core Isolation Cooling System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Filter housing	Pressure Boundary
Heat exchanger (head, shell, and tubesheet)	Pressure Boundary
Heat exchanger (tubes)	Heat Transfer Pressure Boundary
Orifice	Pressure Boundary Throttling
Piping	Pressure Boundary Structural Integrity
Pump casing	Pressure Boundary
Rupture disc	Pressure Boundary
Sparger (steam exhaust)	Pressure Boundary Spray
Strainer	Filtration
Tank	Pressure Boundary
Trap Body	Pressure Boundary Structural Integrity
Tubing	Pressure Boundary Structural Integrity
Turbine Casing	Pressure Boundary
Valve body	Pressure Boundary Structural Integrity

2.3.2.3 High-Pressure Core Spray (HPCS) System

System Description

The HPCS System consists of a motor-driven centrifugal pump, a spray sparger in the reactor vessel located above the core (separate from the LPCS sparger), and associated system piping, valves, controls, and instrumentation. The HPCS System is designed to pump water into the reactor vessel over a wide range of vessel pressures. For small breaks that do not result in rapid depressurization, the system maintains reactor water level. For large breaks, the HPCS System cools the reactor core by spray. The HPCS System also provides for core cooling in the event of a station blackout. Suction piping is provided from the condensate storage tank and also from the suppression pool. The elevation of the HPCS pump is sufficiently below the water level of both the condensate storage tanks and the suppression pool to provide a flooded pump suction and to meet pump net positive suction head (NPSH) requirements with the containment at atmospheric pressure and post-accident debris entrained on the beds of the suction strainers.

The HPCS discharge line fill system is designed to maintain the pump discharge line in a filled condition to ensure the time between the signal to start the pump and the initiation of flow into the reactor vessel is minimized. To ensure that any leakage from the discharge line is replaced and the line is always kept full, a water leg pump system is provided.

Reason for Scope Determination

The HPCS System provides RPV spray cooling during a large-break LOCA that uncovers the core, maintains RPV water level during a small-break LOCA that does not depressurize the reactor vessel, provides Primary Containment isolation and integrity (including valve position indication), and maintains the reactor coolant pressure boundary integrity. All of these system-intended functions are safety-related. Therefore, the HPCS System meets the scoping criteria of 10 CFR 54.4(a)(1).

The HPCS System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The HPCS System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the HPCS System meets the scoping criteria of 10 CFR 54.4(a)(2).

The HPCS System is also relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events.

FSAR References

Section 6.3.2.2.1 of the FSAR describes the HPCS System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M520

Components Subject to AMR

Table 2.3.2-3 lists the component types that require AMR and their intended functions.

Table 3.2.2-3, Aging Management Review Results – High-Pressure Core Spray System, provides the results of the AMR.

The ASME Code Class 1 portions of the HPCS System, from the RPV to and including the outboard containment isolation valve on the injection line, are evaluated with the reactor coolant pressure boundary (see Section 2.3.1.3). The HPCS sparger, located inside the RPV, is evaluated with the Reactor Vessel Internals (see Section 2.3.1.2). Also included in the reactor coolant pressure boundary evaluation (Section 2.3.1.3) are the ASME Code Class 1 portions of the process instrumentation (PI) pressure sensing line out to and including the outboard excess flow check valve.

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

Component Type	Intended Function (as defined in Table 2.0-1)
Actuator housing	Structural Integrity
Bolting	Pressure Boundary Structural Integrity
Flow element	Pressure Boundary Throttling
Orifice	Pressure Boundary Throttling
Piping	Pressure Boundary Structural Integrity
Pump casing	Pressure Boundary
Strainer (screen)	Filtration
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.2.4 Low-Pressure Core Spray (LPCS) System

System Description

The LPCS System consists of a motor-driven centrifugal pump, a spray sparger in the reactor vessel above the core (separate from the HPCS sparger), piping and valves to convey water from the suppression pool to the sparger, and associated controls and instrumentation. The LPCS System is designed to provide cooling to the reactor core only when the reactor vessel pressure is low, as is the case for large LOCA break sizes. However, when LPCS operates in conjunction with the Automatic Depressurization System (ADS), the effective core cooling capability of the LPCS System is extended to all break sizes because the ADS can rapidly reduce the reactor vessel pressure to the LPCS operating range. The LPCS System takes suction from the suppression pool. The LPCS pump is located sufficiently below the water level in the suppression pool to ensure a flooded pump suction and to meet the NPSH requirements with the containment at atmospheric pressure and post-accident debris entrained on the beds of the suction strainers.

The LPCS discharge line fill system is designed to maintain the pump discharge line in a filled condition to ensure the time between the signal to start the pump and the initiation of flow into the RPV is minimized. To ensure that any leakage from the discharge line is replaced and the line is always kept full, a water leg pump system is provided.

Reason for Scope Determination

The LPCS System provides emergency core cooling, Primary Containment isolation and integrity (including valve position indication), and maintains reactor coolant pressure boundary integrity. All of these system-intended functions are safety-related. Therefore, the LPCS System meets the scoping criteria of 10 CFR 54.4(a)(1).

The LPCS System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The LPCS System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the LPCS System meets the scoping criteria of 10 CFR 54.4(a)(2).

The LPCS System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) and Anticipated Transients Without Scram (10 CFR 50.62) regulated events.

FSAR References

Section 6.3.2.2.3 of the FSAR describes the LPCS System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M520

Components Subject to AMR

Table 2.3.2-4 lists the component types that require AMR and their intended functions.

Table 3.2.2-4, Aging Management Review Results – Low-Pressure Core Spray System, provides the results of the AMR.

The ASME Code Class 1 portions of the LPCS System, from the RPV to and including the outboard containment isolation valve are evaluated with the reactor coolant pressure boundary (see Section 2.3.1.3). The LPCS sparger, inside the RPV, is evaluated with the Reactor Vessel Internals (see Section 2.3.1.2). Also included in the reactor coolant pressure boundary evaluation (Section 2.3.1.3) are the ASME Code Class 1 portions of the process instrumentation (PI) pressure sensing line out to and including the outboard excess flow check valve.

The LPCS pump motor includes an oil bath (a reservoir at the top of the motor) for bearing lubrication. A coiled cooling tube is provided to remove heat from the lubricating oil (via Standby Service Water) and is subject to AMR.

Table 2.3.2-4
Low-Pressure Core Spray System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Actuator housing	Structural Integrity
Bolting	Pressure Boundary Structural Integrity
Flow element	Pressure Boundary Throttling
Heat exchanger (tubes)	Heat Transfer Pressure Boundary
Orifice	Pressure Boundary Throttling
Piping	Pressure Boundary Structural Integrity
Pump casing	Pressure Boundary
Strainer (screen)	Filtration
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.2.5 Standby Gas Treatment (SGT) System

System Description

The SGT System is designed to maintain airborne radioactive release from the secondary containment to the atmosphere within the limits required by 10 CFR 50.67. The system is designed to enable purging of the Primary Containment through the SGT System filters when airborne radiation levels inside the Primary Containment are too high to permit direct purging to atmosphere by means of the Reactor Building exhaust system.

The SGT System consists of two fully redundant filter trains, each of which consists of in series a demister (moisture separator), two banks of electric blast coil heaters, a bank of pre-filters, a bank of high-efficiency particulate air (HEPA) filters, two banks of charcoal adsorber filters each with electric strip heaters, and a second bank of HEPA filters, all mounted in a welded steel housing.

Three deluge spray systems are provided for fire protection in each SGT filter train.

Two centrifugal fans are provided with each SGT filter train. Ductwork and butterfly valves on the discharge air side of each filter train are arranged such that either fan can draw air through the filter train and discharge it either out of the Reactor Building, by means of the Reactor Building elevated release duct, or re-circulate it back into the Reactor Building.

During normal plant operation both SGT units are on standby. In this mode, the only portions of the system that are operating are the strip heaters in the charcoal sections, which are cycled on and off by thermostats set to maintain the filter plenum temperature to ensure that the relative humidity within the plenum does not exceed 70 percent. This protects the charcoal adsorber from condensed moisture

Reason for Scope Determination

The SGT System maintains Reactor Building pressure less than atmospheric pressure during post-accident conditions. This system-intended function is safety-related. Therefore, the SGT System meets the scoping criteria of 10 CFR 54.4(a)(1).

The SGT System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The SGT System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the SGT System meets the scoping criteria of 10 CFR 54.4(a)(2).

The SGT System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Section 6.5.1 of the FSAR describes the SGT System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M544, LR-M557

The evaluation boundaries on the discharge side of the SGT System are at the open end located inside the elevated release stack, which is a structural component evaluated within the evaluation boundaries of the Reactor Building (see Section 2.4.2).

The components associated with the deluge spray systems for the SGT filter trains are within the evaluation boundaries of the Fire Protection System (see Section 2.3.3.22).

The NSR portion of the interface with the Containment Exhaust Purge (CEP) System (18”CEP(2)-1) is within the evaluation boundaries of the CEP System (see Section 2.3.3.4).

Components Subject to AMR

Table 2.3.2-5 lists the component types that require AMR and their intended functions.

Table 3.2.2-5, Aging Management Review Results – Standby Gas Treatment System, provides the results of the AMR.

Although the components in the deactivated Main Steam Leakage Control (MSLC) System and the connected SGT components up to spectacle flanges SGT-SF-1 and SGT-SF-2, are classified as Quality Class I, they have no safety function and, for the purposes of AMR, are evaluated as NSR.

Filter media are evaluated as short-lived components (consumables), not subject to AMR. The filter housings do have a pressure boundary function and are subject to AMR.

Heating coils SGT-EHC-1A1, 1A2, 1B1 and 1B2 are electrical components that have no pressure boundary function (they are enclosed along with the filter banks inside the filter unit housings). Therefore, these components are evaluated as electrical commodities in Section 2.5.

Moisture separators SGT-MS-1A and SGT-MS-1B are fully enclosed within the all-welded steel housing of SGT filter units SGT-FU-1A and SGT-FU-1B, respectively, and have no pressure boundary function separate from the associated filter unit housings. However, the moisture separators do perform a water removal function that is performed by metal baffle plates separated by fiberglass pads. Each moisture separator is equipped with a drain pan that functions to direct flow to the associated drain line, which is a pressure boundary function. Therefore, the drain pans are subject to AMR.

Solenoid-operated three-way valves and the associated air lines (highlighted on LR-M544) provide a control air supply to actuators for in-scope valves. However, a failure of the air supply places the valves in a safe position that supports the system function. Therefore, neither pressure-boundary integrity nor structural integrity is a required component intended function of these solenoid valves, air supply lines, or actuators for the system to perform its intended function. Since these components have no other component intended function, they are not subject to AMR.

Table 2.3.2-5
Standby Gas Treatment System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Annubar	Pressure Boundary
Bolting	Pressure Boundary Structural Integrity
Drain Pan	Pressure Boundary
Duct	Pressure Boundary
Fan housing	Pressure Boundary
Filter housing	Pressure Boundary
Flexible connection	Pressure Boundary
Moisture separator	Water Removal
Piping	Pressure Boundary Structural Integrity
Spectacle flange	Pressure Boundary
Tubing	Pressure Boundary
Valve body	Pressure Boundary

2.3.3 Auxiliary Systems

The auxiliary systems are those systems used to support normal and emergency plant operations. The systems provide cooling, ventilation, sampling, and other required functions. The following Columbia systems are addressed in this section:

Circulating Water (CW) System (Section 2.3.3.1)

Condensate Processing Radioactive (Demineralizer) (CPR) System (Section 2.3.3.2)

Containment Atmosphere Control (CAC) System (Section 2.3.3.3)

Containment Exhaust Purge (CEP) and Containment Supply Purge (CSP) Systems (Section 2.3.3.4)

Containment Instrument Air (CIA) System (Section 2.3.3.5)

Containment Monitoring System (CMS) (Section 2.3.3.6)

Containment Nitrogen (CN) System (Section 2.3.3.7)

Containment Return Air (CRA) System (Section 2.3.3.8)

Containment Vacuum Breaker (CVB) System (Section 2.3.3.9)

Control Air System (CAS) (Section 2.3.3.10)

Control Rod Drive (CRD) System (Section 2.3.3.11)

Control Room Chilled Water (CCH) System (Section 2.3.3.12)

Demineralized Water (DW) System (Section 2.3.3.13)

Diesel Building HVAC Systems (Section 2.3.3.14)

Diesel Cooling Water (DCW) System (Section 2.3.3.15)

Diesel (Engine) Exhaust (DE) System (Section 2.3.3.16)

Diesel Engine Starting Air (DSA) System (Section 2.3.3.17)

Diesel Fuel Oil (DO) System (Section 2.3.3.18)

Diesel Generator (DG) System (Section 2.3.3.19)

Diesel Lubricating Oil (DLO) System (Section 2.3.3.20)

Equipment Drains Radioactive (EDR) System (Section 2.3.3.21)

Fire Protection (FP) System (Section 2.3.3.22)

Floor Drain (FD) System (Section 2.3.3.23)

Floor Drain Radioactive (FDR) System (Section 2.3.3.24)

Fuel Pool Cooling (FPC) System (Section 2.3.3.25)

Leak Detection (LD) System (Section 2.3.3.26)

Miscellaneous Waste Radioactive (MWR) System (Section 2.3.3.27)

Plant Sanitary Drains (PSD) System (Section 2.3.3.28)

Plant Service Water (TSW) System (Section 2.3.3.29)

Potable Cold Water (PWC) System (Section 2.3.3.30)

Potable Hot Water (PWH) System (Section 2.3.3.31)

Primary Containment (C) System (Section 2.3.3.32)

Process Sampling (PS) System (Section 2.3.3.33)

Process Sampling Radioactive (PSR) System (Section 2.3.3.34)

Pump House HVAC Systems (Section 2.3.3.35)

Radwaste Building Chilled Water (WCH) System (Section 2.3.3.36)

Radwaste Building HVAC Systems (Section 2.3.3.37)

Reactor Building HVAC Systems (Section 2.3.3.38)

Reactor Closed Cooling Water (RCC) System (Section 2.3.3.39)

Reactor Protection System (RPS) (Section 2.3.3.40)

Reactor Water Cleanup (RWCU) System (Section 2.3.3.41)

Service Air (SA) System (Section 2.3.3.42)

Standby Liquid Control (SLC) System (Section 2.3.3.43)

Standby Service Water (SW) System (Section 2.3.3.44)

Suppression Pool Temperature Monitoring (SPTM) System (Section 2.3.3.45)

Tower Makeup Water (TMU) System (Section 2.3.3.46)

Traversing Incore Probe (TIP) System (Section 2.3.3.47)

A brief system description, reason for scope determination, associated FSAR references, associated license renewal drawings, and components subject to AMR information are provided for each system.

2.3.3.1 Circulating Water (CW) System

System Description

The CW System is a closed cycle cooling system using six mechanical induced draft, cross-flow cooling towers. Three circulating water pumps, located in the Circulating Water Pump House, take suction from a common intake plenum and discharge through a common pipe to the three waterboxes of the condenser. The water from the condenser is returned to the cooling towers, cooled, and collected in the cooling tower basins that supply the circulating water pumps intake plenum.

During a tornado or high wind condition, if there is damage to the service water spray header the Standby Service Water System is aligned for feed and bleed. Feed is provided from the Tower Makeup Water System and the system is aligned to bleed to the CW System.

Reason for Scope Determination

The CW System does not perform any safety-related system-intended functions that meet the scoping criteria of 10 CFR 54.4(a)(1).

The CW System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). The CW System does, however, contain NSR components that perform a 10 CFR 54.4(a)(1) function to support the once-through cooling mode of the Standby Service Water System to mitigate the consequences of a design basis tornado. This system-intended function is an NSAS function. Therefore, the CW System meets the scoping criterion of 10 CFR 54.4(a)(2).

The CW System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 10.4.5.2 of the FSAR describes the Circulating Water System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M507-1, LR-M524-1, LR-M524-2

Components Subject to AMR

Table 2.3.3-1 lists the component types that require AMR and their intended functions.

Table 3.3.2-1, Aging Management Review Results – Circulating Water System, provides the results of the AMR.

Table 2.3.3-1
Circulating Water System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary
Piping	Pressure Boundary
Rupture disc	Pressure Boundary
Valve body	Pressure Boundary

2.3.3.2 Condensate Processing Radioactive (Demineralizer) (CPR) System

System Description

The CPR System, also referred to as the Condensate Filter Demineralizer System, is designed to maintain feedwater quality such that the reactor water limits are not exceeded. The system removes corrosion products, condenser inleakage impurities, and impurities present in the condensed steam. The system controls the condensate impurity concentration during plant operation. The system functions as a chemical mixing and supply system to clean the filter demineralizer units and direct the waste to the chemical waste system, as a backwash system to remove the spent resin from the filter demineralizers and direct the waste to the backwash receiving tank, and as a precoat system to circulate fresh precoat material through the filter demineralizers.

Reason for Scope Determination

The CPR System does not perform any safety-related system-intended functions that meet the scoping criteria of 10 CFR 54.4(a)(1).

The CPR System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The CPR System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the CPR System meets the scoping criterion of 10 CFR 54.4(a)(2).

The CPR System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 10.4.6 of the FSAR describes the Condensate Filter Demineralizer System, evaluated for license renewal as the Condensate Processing Radioactive (Demineralizer) System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M523-1, LR-M526-1

Components Subject to AMR

Table 2.3.3-2 lists the component types that require AMR and their intended functions.

Table 3.3.2-2, Aging Management Review Results – Condensate Processing Radioactive (Demineralizer) System, provides the results of the AMR.

**Table 2.3.3-2
Condensate Processing Radioactive (Demineralizer) System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Structural Integrity
Piping	Structural Integrity

2.3.3.3 Containment Atmosphere Control (CAC) System

System Description

The CAC System, which consists solely of the hydrogen-oxygen recombiner system, has been deactivated. The associated primary containment penetrations have been permanently plugged. The CAC System and components no longer provide a process function, but are required to maintain piping system structural integrity.

Combustible gas control in the Primary Containment is performed by the RHR System in containment spray mode (see Section 2.3.2.1), in conjunction with the reactor head area return fans (see Section 2.3.3.8).

Reason for Scope Determination

The CAC System does not perform any safety-related system-intended functions that meet the scoping criteria of 10 CFR 54.4(a)(1).

The CAC System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The CAC System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the CAC System meets the scoping criteria of 10 CFR 54.4(a)(2).

The CAC System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 6.2.5 of the FSAR discusses combustible gas control in containment, and describes the hydrogen-oxygen recombiners, and associated piping and components, as deactivated, retained solely for their structural continuity with the containment penetrations.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M554

Components Subject to AMR

Table 2.3.3-3 lists the component types that require AMR and their intended functions.

Table 3.3.2-3, Aging Management Review Results – Containment Atmosphere Control System, provides the results of the AMR.

Although the components in the deactivated CAC System are classified as Quality Class I, they have no safety function and for the purposes of AMR are evaluated as NSR.

Table 2.3.3-3
Containment Atmosphere Control System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Structural Integrity
Heat exchanger (channel and shell)	Structural Integrity
Orifice	Structural Integrity
Piping	Structural Integrity
Strainer (body)	Structural Integrity
Tank	Structural Integrity
Tubing	Structural Integrity
Valve body	Structural Integrity

2.3.3.4 Containment Exhaust Purge (CEP) and Containment Supply Purge (CSP) Systems

System Description

The Primary Containment is provided with Containment Exhaust and Supply Purge systems to reduce residual contamination and to de-inert the containment prior to personnel access. The drywell is purged of nitrogen for scheduled refueling outages and as required for inspection or maintenance.

Purge air is taken from the Reactor Building ventilation supply duct through two normally closed isolation valves into the Primary Containment. The purged nitrogen is extracted from the drywell through two normally closed isolation valves and is routed to one of two systems. The discharge can be routed through a normally closed isolation valve to the Reactor Building exhaust air plenum or to the SGT System. Provision is also made to purge the nitrogen from the suppression chamber section of the Primary Containment. Purge air is taken from the Reactor Building supply duct through two normally closed valves into the suppression chamber. The nitrogen is extracted from the suppression chamber through two normally closed isolation valves and routed to the exhaust air plenum or the SGT System.

The systems are designed to purge either the drywell or the suppression chamber, or the two chambers in series or in parallel. Purge system operation during reactor operation, including startup, hot standby, and hot shutdown is limited to inerting (through the purge system), de-inerting, and pressure control. The containment purge systems are not used to control temperature or humidity during reactor operation.

The drywell and suppression chamber purge lines have isolation capabilities. Valve operability and reliability are enhanced by the placement of both valves outside containment. Stainless steel grills (debris screens) are installed across both purge supply line openings (one low in the drywell and the other low in the suppression chamber) and across the purge exhaust line opening high in the drywell to prevent debris from entering the purge lines and obstructing the seating of the isolation valves.

Reason for Scope Determination

The Containment Exhaust Purge (CEP) and Containment Supply Purge (CSP) systems provide Primary Containment isolation and integrity. This system-intended function is safety-related. Therefore, the CEP and CSP systems meet the scoping criteria of 10 CFR 54.4(a)(1).

The CEP and CSP systems do not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The CEP and CSP systems do, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the CEP and CSP systems meet the scoping criteria of 10 CFR 54.4(a)(2).

The CEP and CSP systems are relied upon to demonstrate compliance with, and meet the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Sections 6.2.1.1.8.2 and 6.2.4.3.2.2.3.2 of the FSAR describe the CEP and CSP systems.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M543-3, LR-M544, LR-M545-3, LR-M619-161

Components assigned by equipment piece number (EPN) to the Reactor Building Exhaust Air (REA) System and process lines for associated components assigned to process instrumentation (PI) are included within the evaluation boundaries of the CEP and CSP systems for completeness (see LR-M543-3 and LR-M545-3).

Components Subject to AMR

Table 2.3.3-4 lists the component types that require AMR and their intended functions.

Table 3.3.2-4, Aging Management Review Results – Containment Exhaust Purge and Containment Supply Purge Systems, provides the results of the AMR.

The valve actuators (air operators) for valves CSP-V-1 through CSP-V-4, CEP-V-1A through CSP-V-4A, and CEP-V-1B through CSP-V-4B, the three-way solenoid-operated valves, and the associated air lines that are highlighted on LR-M543-3 provide a control air supply to an air actuator for a valve that is in the license renewal scope. However, a failure of the air supply (for valves CSP-V-1 through CSP-V-4, CEP-V-1A through CSP-V-4A, and the parallel B valves) places the valve in a safe (fail-closed) position. Therefore, pressure-boundary integrity is not a required component function of these solenoid valves, air supply lines, or air actuators for the system to perform its intended function. Because these components have no other intended function, they are not subject to AMR.

The air actuators and associated air supplies to valves CSP-V-5, CSP-V-6, and CSP-V-9 are required for the system to perform its intended function. These valves fail open on loss of air and require air which is provided from a safety-related source, CSP-TK-51, to close. These components are subject to AMR.

Nitrogen storage bottles (CSP-TK-1 through CSP-TK-10) are within the scope of license renewal. The bottles are consumables, replaced periodically in accordance with Department of Transportation Standards, and are not subject to AMR.

Table 2.3.3-4
Containment Exhaust Purge and Containment Supply Purge Systems
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Actuator housing	Pressure Boundary
Annubar	Structural Integrity
Bolting	Pressure Boundary Structural Integrity
Damper housing	Structural Integrity
Flexible connection	Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Screen (debris)	Filtration
Tank (CSP-TK-51)	Pressure Boundary
Tubing	Pressure Boundary
Valve body (including nitrogen pressure regulator)	Pressure Boundary Structural Integrity

2.3.3.5 Containment Instrument Air (CIA) System

System Description

The CIA System delivers clean, dry, compressed gas, nitrogen or air, to the main steam relief valve and main steam isolation valve accumulators inside Primary Containment. The safety-related function of the CIA System is to provide compressed gas to the accumulators to cycle the Automatic Depressurization System (ADS) Main Steam Relief Valves (MSRVs) should the normal supply of compressed gas become unavailable. The NSR function of the CIA System is to provide compressed gas from the Containment Nitrogen System to station instrumentation, controls and accumulators for valve actuators (inboard main steam isolation valves (MSIVs)) inside of containment, non-ADS MSRVs, set pressure verification device, and reactor recirculation cooling pump seal drain valves.

Reason for Scope Determination

The CIA System provides Primary Containment isolation and integrity, and supplies nitrogen to ADS MSRV accumulators in support of short-term and long-term core cooling. These system-intended functions are safety-related. Therefore, the CIA System meets the scoping criteria of 10 CFR 54.4(a)(1).

The CIA System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The CIA System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the CIA System meets the scoping criteria of 10 CFR 54.4(a)(2).

The CIA System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events.

FSAR References

Sections 9.3.1.1.2 and 9.3.1.3.2 of the FSAR describe the Containment Instrument Air System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M556-1, LR-M556-2, LR-M529

The piping and valves associated with containment penetrations X56, X89B, and X91 are part of the CIA System.

Accumulators that are assigned by EPN to the Main Steam (MS) System are included within the evaluation boundaries of the CIA System for completeness (see LR-M556-1).

Components Subject to AMR

Table 2.3.3-5 lists the component types that require AMR and their intended functions.

Table 3.3.2-5, Aging Management Review Results – Containment Instrument Air System, provides the results of the AMR.

Component filter media are evaluated as short-lived components (consumables), and are not subject to AMR. The associated filter bodies have a pressure boundary function and are subject to AMR.

Nitrogen storage bottles (CIA-TK-1A thru CIA-TK-15A and CIA-TK-1B thru CIA-TK-19B) are within the scope of license renewal. The bottles are evaluated as consumables, replaced periodically in accordance with Department of Transportation Standards, and are not subject to AMR.

During normal operation the compressed air supply to the MSIV actuators maintains the valves open. Loss of compressed air due to loss of non-seismic air lines results in loss of pilot air and closure of the MSIV by both spring force and pneumatic air cylinder force. Loss of compressed air due to loss of Seismic Category I air lines results in loss of both pilot air and actuator air with the MSIVs closing by spring force only. Therefore, pressure-boundary integrity is not a required component function of the components of the compressed air supply to the MSIVs for the system to perform its intended function. Because these components have no intended function, they are not subject to AMR.

**Table 2.3.3-5
Containment Instrument Air System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Accumulator	Pressure Boundary
Bolting	Pressure Boundary Structural Integrity
Filter body	Pressure Boundary
Flexible connection	Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Pressure regulator	Pressure Boundary
Tubing	Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.6 Containment Monitoring System (CMS)

System Description

The CMS consists of instrumentation categorized as Regulatory Guide (RG) 1.97 (Category 1 and 2) that provides post-accident monitoring information to the operator to enable assessment of the status of safety-related systems. The Category 1 parameters monitored by the CMS are Primary Containment hydrogen and oxygen concentration, radiation level, and pressure, suppression pool chamber pressure, and suppression pool water level. The Category 2 parameters monitored by the CMS are drywell and suppression pool atmosphere temperature and suppression pool water temperature.

Reason for Scope Determination

The CMS provides containment integrity and RG 1.97 Category 1 post-accident monitoring parameters. These system-intended functions are safety-related. Therefore, the CMS meets the scoping criteria of 10 CFR 54.4(a)(1).

The CMS does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The CMS does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the CMS meets the scoping criteria of 10 CFR 54.4(a)(2).

The CMS is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events.

FSAR References

Sections 7.5 and F.4.3 of the FSAR describe the Containment Monitoring System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M543-1, LR-M543-2

Instruments assigned by EPN to the Heat Tracing System and HPCS System and process lines for associated components assigned to process instrumentation (PI) are included within the evaluation boundaries of the CMS for completeness (see LR-M543-1 and LR-M543-2).

Components Subject to AMR

Table 2.3.3-6 lists the component types that require AMR and their intended functions.

Table 3.3.2-6, Aging Management Review Results – Containment Monitoring System, provides the results of the AMR.

The hydrogen and oxygen monitors (CMS-O2/H2R-1, 2) are active components and are not subject to AMR.

Gas storage bottles (CMS-TK-1301 through 1305 and CMS-TK-1401 through 1405) are within the scope of license renewal. The gas bottles are evaluated as consumables, replaced periodically in accordance with Department of Transportation Standards, and are not subject to AMR.

Table 2.3.3-6
Containment Monitoring System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary
Piping	Pressure Boundary
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary

2.3.3.7 Containment Nitrogen (CN) System

System Description

The CN System provides nitrogen to the Containment Instrument Air System for normal plant operation. A CN System cryogenic storage vessel (tank) supplies the nitrogen, which is also the source of nitrogen for inerting the Primary Containment atmosphere.

Reason for Scope Determination

The CN System provides emergency cutoff of nitrogen flow. This system-intended function is safety-related. Therefore, the CN System meets the scoping criteria of 10 CFR 54.4(a)(1).

The CN System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The CN System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the CN System meets the scoping criteria of 10 CFR 54.4(a)(2).

The CN System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 9.3.1.1.2 of the FSAR describe the Containment Nitrogen System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M783

Components Subject to AMR

Table 2.3.3-7 lists the component types that require AMR and their intended functions.

Table 3.3.2-7, Aging Management Review Results – Containment Nitrogen System, provides the results of the AMR.

The solenoid pilot valves and associated air lines provide a control air supply to actuators for the CN System isolation valves (CN-V-106 and 107). However, a failure of the air supply places the valve in a safe position that supports the system function. Therefore, pressure-boundary integrity is not a required component intended function of these solenoid valves, air supply lines, or actuators for the system to perform its intended function. Since these components have no other component intended function, they are not subject to AMR.

The cryogenic nitrogen storage tank (CN-TK-1) consists of an outer and inner vessel. The outer vessel provides support for NSR piping that is attached to a safety-related component and is subject to AMR. The outer vessel will contain fluid leakage in the event of a failure of the inner vessel; therefore the failure of the inner vessel does not create a potential for spatial interaction that could prevent a safety-related SSC from performing its intended function. The inner vessel does not perform an intended function and is not subject to AMR.

Heat exchangers CN-VZ-1, CN-VZ-2A/B, and CN-VZ-3 provide support for NSR piping attached to safety-related component and are required to prevent spatial interaction that could prevent safety-related components from performing their intended function. Heat exchanger CN-VZ-1 consists of a shell and channel heads that are subject to AMR. Heat exchanger CN-VZ-2A/B consists of tubes in an open frame. Heat exchanger CN-VZ-3 consists of a shell and tubes. The internal components (tubes) of heat exchanger CN-VZ-3 are not subject to AMR since the shell will contain leakage in the event of an internal component failure.

Table 2.3.3-7
Containment Nitrogen System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Structural Integrity
Heat exchanger, CN-VZ-1 (channel head, shell)	Structural Integrity
Heat exchanger, CN-VZ-2A/B (frame, tubes)	Structural Integrity
Heat exchanger, CN-VZ-3 (shell)	Structural Integrity
Orifice	Structural Integrity
Piping	Structural Integrity
Tank	Structural Integrity
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.8 Containment Return Air (CRA) System

System Description

The function of the CRA System is to maintain temperatures throughout the containment at suitable levels for equipment and personnel protection during reactor operations and shutdown.

Primary containment cooling is provided by five fan coil units that recirculate air through water-cooled coils for heat removal. Each of the five fan coil units consists of two fans, both of which operate at the same time, and a water cooling coil in a sheet metal housing. Water is supplied to the unit cooling coils from the Reactor Building Closed Cooling Water System.

Seven recirculation fans and two reactor head area return fans provide additional air turbulence to prevent pockets of hot air from developing and to ensure post-LOCA hydrogen mixing. Three recirculating fans are located at lower levels and four fans are located at upper levels in the drywell to provide air circulation.

The CRA System does not have to operate in the event of a LOCA; however, the head return fans (CRA-FN-4A/B) operate post-LOCA to help ensure atmospheric hydrogen mixing.

Reason for Scope Determination

The CRA System recirculates air inside Primary Containment to minimize stagnant areas, and circulates air post-LOCA to ensure hydrogen mixing by means of the reactor head area return fans. These system-intended functions are safety-related. Therefore, the CRA System meets the scoping criteria of 10 CFR 54.4(a)(1).

The CRA System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The CRA System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). . Therefore, the CRA System does not meet the scoping criterion of 10 CFR 54.4(a)(2).

The CRA System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Section 9.4.11.2 of the FSAR describes the primary containment cooling system, evaluated for license renewal as the Containment Return Air System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M543-1

Components Subject to AMR

Table 2.3.3-8 lists the component types that require AMR and their intended functions.

Table 3.3.2-8, Aging Management Review Results – Containment Return Air System, provides the results of the AMR.

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

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary
Duct	Pressure Boundary
Fan housing	Pressure Boundary

2.3.3.9 Containment Vacuum Breaker (CVB) System

System Description

The Primary Containment is designed for negative pressure loadings of drywell pressure two pounds per square inch (psi) below Reactor Building pressure, wetwell pressure two psi below Reactor Building pressure, and upward pressure across the diaphragm floor (wetwell to drywell) of 6.4 pounds per square inch differential.

There are nine wetwell-to-drywell vacuum breaker lines and three reactor building-to-wetwell vacuum breaker lines installed to ensure that these negative loads are not exceeded. Each of the vacuum breakers operates automatically to control containment vacuum.

The reactor building-to-wetwell valves prevent excessive vacuum from developing in the primary containment vessel from such causes as inadvertent containment spray actuation.

The wetwell-to-drywell valves attached to the downcomers in the suppression chamber are provided to return noncondensibles from the wetwell to the drywell to prevent too large an upward pressure differential across the diaphragm floor after a LOCA.

During normal plant operation, the reactor building-to-wetwell valves (butterfly valves) are maintained closed. The control air supply line to the wetwell-to-drywell valves is isolated during normal operation.

As discussed below, the components of the downcomer vent system are included in the CVB System evaluation boundary. The downcomer vent system functions to channel the steam accumulating in the drywell chamber during a LOCA into the wetwell chamber to accomplish pressure suppression. The downcomer vent system consists of 99 pipes running vertically downward from the diaphragm floor. Originally 102 downcomers were provided, but three were capped. The downcomers are embedded in the diaphragm floor. Nine of the downcomers are attached to vacuum breaker valves. The penetration for the main steam safety relief valve piping is welded to these downcomers. All 102 downcomers are within the scope of license renewal.

Reason for Scope Determination

The CVB System provides vacuum relief to the drywell. This system-intended function is safety-related. Therefore, the CVB System meets the scoping criteria of 10 CFR 54.4(a)(1).

The CVB System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The CVB System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the CVB System does not meet the scoping criterion of 10 CFR 54.4(a)(2).

The CVB System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) and Anticipated Transients Without Scram (10 CFR 50.62) regulated events.

FSAR References

Sections 3.8.2.1.3 and 6.2.1.1.8.1 of the FSAR describe the vacuum relief system, evaluated for license renewal as the CVB System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M543-1, LR-M529

The downcomers on drawing LR-M529 are vent pipes that connect the drywell to the wetwell and provide the flowpath for steam from pipe breaks in the drywell to be condensed in the suppression pool. Since these downcomers are similar to those in the CVB System used for vacuum relief and since there is no EPN identified on the flow diagrams, they are addressed collectively in the CVB System. The functions of the downcomers for license renewal are included above. Representative downcomers for the Main Steam System and the CVB System are shown on drawings LR-M543-1 and LR-M529. There is no flow diagram that shows all 102 downcomers.

Components Subject to AMR

Table 2.3.3-9 lists the component types that require AMR and their intended functions.

Table 3.3.2-9, Aging Management Review Results – Containment Vacuum Breaker System, provides the results of the AMR.

Table 2.3.3-9
Containment Vacuum Breaker System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary
Piping (including downcomers)	Pressure Boundary
Valve body	Pressure Boundary

2.3.3.10 Control Air System (CAS)

System Description

The CAS provides oil-free, filtered, and dried instrument-quality air throughout the plant for pneumatic instrumentation, controls, and actuators. The CAS also provides air to the outboard MSIV accumulators, and to the wetwell vacuum breaker solenoid pilot valves. The system is designed to provide uninterrupted service during normal plant operation.

The air receivers store compressed air to serve associated pneumatic loads. The Cooling Jacket Water (CJW) System is a closed water system provided to cool the three CAS compressors and the two CAS refrigerated dryers. Operation of CAS is not required for the initiation of any engineered safeguard system or for safe shutdown of the reactor, but is required for continuous plant operation. Based on this, operation of the CAS is not required for mitigation of a design basis accident or abnormal operational transient.

Reason for Scope Determination

The CAS provides Primary Containment isolation and integrity. This system-intended function is safety-related. Therefore, the CAS meets the scoping criteria of 10 CFR 54.4(a)(1).

The CAS does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The CAS does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the CAS meets the scoping criteria of 10 CFR 54.4(a)(2).

The CAS is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Sections 9.3.1.1.1 and 9.3.1.3.1 of the FSAR describe the Control Air System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M510-2, LR-M510-2A

Components Subject to AMR

Table 2.3.3-10 lists the component types that require AMR and their intended functions.

Table 3.3.2-10, Aging Management Review Results – Control Air System, provides the results of the AMR.

The piping and valves associated with containment penetration X82e are part of the CAS.

Accumulators that are assigned by EPN to the Main Steam (MS) System are included within the evaluation boundaries of the CAS for completeness.

The compressed air supply to the MSIV actuators maintains the required air for holding the valves open. Loss of compressed air due to loss of non-seismic air lines results in loss of pilot air and closure of the MSIV by both spring force and pneumatic air cylinder force. Loss of compressed air due to loss of Seismic Category I air lines results in loss of both pilot air and actuator air with the MSIVs closing by spring force only. Therefore, pressure-boundary integrity is not a required component function of the components of the compressed air supply to the MSIVs for the system to perform its intended function. Because these components have no intended function, they are not subject to AMR.

Table 2.3.3-10
Control Air System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.11 Control Rod Drive (CRD) System

System Description

The CRD System controls gross changes in core reactivity by incrementally positioning neutron absorbing control rods within the reactor core in response to manual control signals. It is also required to quickly shut down the reactor (scram) in emergency situations by rapidly inserting withdrawn control rods into the core in response to a manual or automatic signal. The CRD System consists of locking piston CRD mechanisms and the hydraulic system.

The CRD hydraulic system consists of hydraulic control units, a hydraulic power supply (pumps), interconnecting piping, and instrumentation. The CRD hydraulic system delivers clean, demineralized water for driving, rapid insertion, and cooling functions related to the operation of the 185 control rod drives.

Prefabricated hydraulic control units for the locking piston drives are located in the Reactor Building, close to, but outside of the drywell. These hydraulic control units manage water flow to and from the control rod.

One supply pump pressurizes the system with water from a condensate supply header, which takes suction from the condensate treatment system or condensate storage tanks. A portion of the pump discharge flow is diverted through a minimum flow bypass line to the condensate storage tank.

The scram accumulators store sufficient energy to fully insert a control rod at lower vessel pressures. At higher vessel pressures the accumulator pressure is assisted or supplanted by reactor vessel pressure. The accumulator is a hydraulic cylinder with a free-floating piston. The piston separates the water on top from the nitrogen below. During a scram the scram inlet (and outlet) valves open and permit the stored energy in the accumulators to discharge into the drives.

The scram discharge volume (SDV) header system is designed as a continually expanding path from the 185 individual scram discharge (withdrawal) lines to one of two integrated scram discharge volume and instrument volume (SDV/IV) systems (one system per approximately half the drives). During normal plant operation, each SDV is empty and vented to the atmosphere through its open vent and drain valves. When a scram occurs, these vent and drain valves are closed to conserve reactor water.

Reason for Scope Determination

The CRD System provides emergency reactor shutdown (scram), Primary Containment isolation and integrity, secondary containment bypass leakage isolation valves, and maintains reactor coolant pressure boundary integrity. These system-intended functions are safety-related. Therefore, the CRD System meets the scoping criteria of 10 CFR 54.4(a)(1).

The CRD System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The CRD System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the CRD System meets the scoping criteria of 10 CFR 54.4(a)(2).

The CRD System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) and Anticipated Transients Without Scram (10 CFR 50.62) regulated events.

FSAR References

Section 4.6.1.1 of the FSAR describes the CRD System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M528-1, LR-M528-2, LR-M520, LR-M523-2, LR-M530-1

Components Subject to AMR

Table 2.3.3-11 lists the component types that require AMR and their intended functions.

Table 3.3.2-11, Aging Management Review Results – Control Rod Drive System, provides the results of the AMR.

The strainer (CRD-ST-3) on the scram discharge header vent line to the Reactor Building radioactive floor sump (FDR-SUMP-R3) is located within the sump. Since the strainer is submerged within the sump, a failure does not create a potential for spatial interaction that could prevent the performance of the intended functions of safety-related SSCs. This strainer is, therefore, not subject to AMR.

CRD-SPV-110A/B, CRD-SPV-9, and CRD-SPV-182 are safety-related valves that receive signals from the Reactor Protection System. CRD-SPV-117/* and CRD-SPV-118/* are the safety-related scram pilot valves. CRD-SPV-24A/B, 25A/B, 26A/B, 27A/B, and 28 are NSR valves that are in scope for an anticipated transients without scram event and receive signals from the Alternate Rod Insertion System. An age-related failure of any of these valves will result in a slow or partial loss of air pressure in the instrument air supply to SDV/IV vent and drain valves or to the individual hydraulic control unit scram pilot valves.

In the event of a slow or partial loss of air pressure, the high-level scram setpoint and the SDV/IV system capacity ensure that scram capability is maintained even in the event of maximum inleakage into the SDV prior to a scram. Analysis shows that adequate scram discharge volume will remain in the SDV system at the time that a scram is initiated. A partial loss of air pressure does not result in the uncontrolled release of reactor coolant to the reactor building should all or most of the scram discharge valves lift. When the water buildup reaches scram initiation level in the IV, a scram signal is produced. This will cause the air supply to the vent and drain valves to vent, thereby ensuring that the vent and drain valves close and isolate. For leakage rates that do not result in buildup in the IV, the leak will drain to the reactor building equipment drain system.

Additionally, on loss of electrical signal to the pilot valves, such as the loss of external AC power, the inlet ports close and the exhaust ports open on both valves. The pilot valves are arranged so that the trip system signal must be removed from both valves before air pressure can be discharged from the scram valve operators. This prevents the inadvertent scram of a single drive in the event of a failure of one of the pilot valve solenoids.

Therefore, a pressure-boundary failure in the instrument air supply does not prevent the satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1), and these CRD valves are not subject to AMR.

A flexible connection (CRD-FLX-2) used to drain the hydraulic control units to the Equipment Drains Radioactive System is not normally attached to the CRD System. Therefore, the flexible connection is not subject to AMR since its failure does not create a potential for spatial interaction that could prevent the performance of the intended functions of safety-related SSCs.

Filter media are evaluated as short-lived components (consumables), and are not subject to AMR because they are periodically inspected and replaced. The associated filter bodies perform a pressure boundary function and are subject to AMR. The filter units (CRD-F-134, 135, and 136) that fit inside the hydraulic control unit manifold do not have separate pressure boundary function and are not subject to AMR.

The CRD mechanisms are specifically excluded from AMR by 10 CFR 54.21(a)(1)(i). The CRD housings attached to the reactor vessel are evaluated with the RPV (see Section 2.3.1.1). The CRD thermal sleeves are evaluated with the Reactor Vessel Internals (see Section 2.3.1.2). The remaining portions of the CRD System are evaluated as part of the reactor coolant pressure boundary (see Section 2.3.1.3).

Table 2.3.3-11
Control Rod Drive System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Accumulator	Pressure Boundary
Bolting	Pressure Boundary Structural Integrity
Filter body	Pressure Boundary Structural Integrity
Flow element	Structural Integrity
Gear unit (CRD pumps)	Structural Integrity
Heat exchanger (channel and shell)	Structural Integrity
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Pump casing	Structural Integrity
Rupture disc (nitrogen cylinders)	Pressure Boundary
Strainer body	Structural Integrity
Tank (SDV and nitrogen cylinders)	Pressure Boundary
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.12 Control Room Chilled Water (CCH) System

System Description

The CCH System is normally used only during emergency conditions. The CCH System or the Standby Service Water (SW) System can maintain control room temperature within the design limit of 104 °F in the event both radwaste chillers are inoperative (emergency condition).

In an emergency condition (loss of Radwaste Building chilled water during design basis accident), the cooling coil (WMA-CC-51A1) serving air handling unit WMA-AH-51A is supplied with SW. The cooling coil (WMA-CC-51B1) serving air handling unit WMA-AH-51B can be set to be automatically supplied with emergency chilled water. The cooling coil for air handling unit WMA-AH-51A can be supplied by CCH and the cooling coil for WMA-AH-51B can be supplied by SW, if necessary.

The CCH System consists of two independent trains, each containing a circulating pump and chiller unit. The chiller unit is made up of a compressor and associated motor and lubricating subsystem, a condenser, and an evaporator. Cooling of the condenser is provided by the SW System. The chilled water is supplied to, and returned from, the cooling coils by SW piping.

Reason for Scope Determination

The CCH System maintains the passive integrity of the safety-related standby service water boundary (CCH-CU-1A, CCH-CU-1B only), and provides chilled water to the control room air handling unit cooling coils (WMA-CC-51A/B-1). These system-intended functions are safety-related. Therefore, the CCH System meets the scoping criteria of 10 CFR 54.4(a)(1).

The CCH System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The CCH System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the CCH System meets the scoping criteria of 10 CFR 54.4(a)(2).

The CCH System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 9.4.1 of the FSAR describes the Control Room Chilled Water System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M775

Components Subject to AMR

Table 2.3.3-12 lists the component types that require AMR and their intended functions.

Table 3.3.2-12, Aging Management Review Results – Control Room Chilled Water System, provides the results of the AMR.

Component filter media are evaluated as short-lived components (consumables), and are not subject to AMR because they are periodically inspected and replaced. The associated filter bodies perform a pressure boundary function and are subject to AMR.

**Table 2.3.3-12
Control Room Chilled Water System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Filter body	Pressure Boundary
Flexible connection	Pressure Boundary
Heat exchanger (CCH chiller units - channel, shell, and tubesheet)	Pressure Boundary
Heat exchanger (CCH chiller units - tubes)	Heat Transfer Pressure Boundary
Heat exchanger (lube oil coolers - tubes)	Heat Transfer Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Pump casing (pumps and compressors)	Pressure Boundary
Purge unit (chiller condenser)	Gas Removal Pressure Boundary
Rupture disc (chiller units and pump suction piping)	Pressure Boundary
Sight glass (chiller lube oil and refrigerant level)	Pressure Boundary
Tubing	Pressure Boundary
Valve body	Pressure Boundary

2.3.3.13 Demineralized Water (DW) System

System Description

The DW System is designed to utilize the demineralized effluent from the plant makeup water treatment system to provide demineralized water to the condensate storage tanks and to distribute demineralized water throughout the plant.

The DW System consists of a storage tank and two transfer pumps. During operation, one transfer pump runs normally to keep the system headers pressurized to supply demineralized water on demand. The operating pump recirculates a minimum flow back to the storage tank to prevent damage to the pump under low flow conditions.

Reason for Scope Determination

The DW System provides Primary Containment isolation and integrity. This system-intended function is safety-related. Therefore, the DW System meets the scoping criteria of 10 CFR 54.4(a)(1).

The DW System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The DW System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the DW System meets the scoping criteria of 10 CFR 54.4(a)(2).

The DW System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 9.2.3 of the FSAR describes the Demineralized Water System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M517

Components Subject to AMR

Table 2.3.3-13 lists the component types that require AMR and their intended functions.

Table 3.3.2-13, Aging Management Review Results – Demineralized Water System, provides the results of the AMR.

Table 2.3.3-13
Demineralized Water System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity
Sight glass	Structural Integrity
Spectacle flange	Structural Integrity
Tubing	Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.14 Diesel Building HVAC Systems

System Description

Each of the three diesel generator (DG) rooms (Division 1, Division 2, and Division 3) is serviced by a separate, but essentially identical Diesel Building HVAC system. Each Diesel Building HVAC system is comprised of three separate sub-systems: Diesel Building Exhaust Air (DEA), Diesel Building Mixed Air (DMA), and Diesel Building Outside Air (DOA). A fourth sub-system, Diesel Building Return Air (DRA), provides ventilation for the Division 3 generator room and the fire deluge equipment room. Also included within the Diesel Building HVAC systems is the emergency cable cooling ventilation system.

With the exception of the fuel oil day tank room and the fuel oil pump room exhaust fans, the function of the Diesel Building HVAC systems is to maintain suitable temperatures within the rooms for equipment operation. The exhaust fans provided in each of the three fuel oil day tank rooms and each of the three fuel oil pump rooms prevent the buildup of oil fumes.

The Diesel Building HVAC systems operate automatically to maintain ambient temperature below equipment operability limits during all emergency modes of operation for the various locations in the Diesel Generator Building.

Each Diesel Building HVAC system operates as a “push-pull” ventilation system, with an exhaust system for each fuel oil day tank room. Each “push-pull” ventilation system is composed of two air-handling units (DMA), an exhaust fan (DEA), and associated ductwork and controls. The two air-handling units share a fresh air intake plenum and a common intake air filter bank (DOA). Each air-handling unit has a water cooling coil (with a bypass damper) and a centrifugal fan in a sheet metal housing.

Normally, the smaller of the two air-handling units operates to maintain proper temperatures in the DG room. Heating is provided by an electric blast coil heater located in the air handling unit discharge duct. When a diesel generator is started, the larger air-handling unit and the main exhaust fan automatically start, and SW is supplied to the water cooling coils in both air-handling units. The exhaust fan ductwork is arranged such that the exhaust air can be discharged outside (via the pipe area) or recirculated through the two air-handling units in any proportion from zero percent to 100 percent to control supply air temperature. The water cooling coils provide additional cooling during periods of high outdoor air temperatures.

The critical electric cabling that runs between the emergency diesel generator sets and the main control room and critical switchgear room is routed in corridors adjacent to the Diesel Generator Building and in corridors between the Reactor Building and Radwaste Building. These corridors are normally ventilated by the Turbine Building and Radwaste Building ventilation systems; however, an emergency cable cooling ventilation system is provided to ensure that ambient temperatures in the corridors do not exceed the ambient environmental temperatures for which the cables are rated, in the event of loss of offsite power.

The emergency cable cooling ventilation system is composed of one exhaust fan and one supply air-handling unit. The exhaust fan, which is normally in standby, starts automatically when the Division 1 diesel generator set is started. The air-handling unit is normally in standby and starts automatically when the Division 2 diesel generator set is started.

Reason for Scope Determination

The Diesel Building HVAC systems provide:

- emergency heating, ventilation, and cooling to the Diesel Generator Building [DEA and DMA]
- filtered outside air to the Diesel Generator Building and cable corridor [DOA]

These system-intended functions are safety-related. Therefore, the Diesel Building HVAC systems meet the scoping criteria of 10 CFR 54.4(a)(1).

The Diesel Building HVAC systems do not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The Diesel Building HVAC systems do, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the Diesel Building HVAC systems meet the scoping criteria of 10 CFR 54.4(a)(2). [DEA, DMA, DOA]

The Diesel Building HVAC systems are relied upon to demonstrate compliance with, and meet the 10 CFR 54.4(a)(3) scoping criteria for the following regulated events (the associated system is indicated in brackets):

- Fire Protection (10 CFR 50.48) [DEA, DMA, DOA, DRA]
- Anticipated Transients Without Scram (10 CFR 50.62) [DEA, DMA, DOA]
- Station Blackout (10 CFR 50.63) [DEA, DMA, DOA]

FSAR References

Sections 9.4.7 and 9.4.8 of the FSAR describes the Diesel Building HVAC systems.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M551

The fuel oil pump room exhaust systems are classified as NSR and cannot affect the function of a safety-related system or component. Therefore, they are not in the scope of license renewal.

Components Subject to AMR

Table 2.3.3-14 lists the component types that require AMR and their intended functions.

Table 3.3.2-14, Aging Management Review Results – Diesel Building HVAC Systems, provides the results of the AMR.

Outdoor air intake louvers at the supply ends of Diesel Building HVAC systems do not perform a component intended function for license renewal, and therefore, are not subject to AMR. The associated housings (damper housings) have a pressure boundary function and are subject to AMR.

Component filter media are short-lived components (consumables), and are not subject to AMR. The associated filter housings have a pressure boundary function and are subject to AMR.

The outside air intake filters (DOA-FL-11/1, 11/3, 21/1, 21/3, 31/1 and 31/3) are mounted within the Diesel Building structure (in the wall), are not attached to safety-related ductwork, and have no separate pressure boundary function. Therefore, these filters are not subject to AMR. There is no associated housing to consider.

Electric blast coil heaters that are located within the evaluation boundaries of the HVAC systems are either installed in ducts or in air-handling units. In both cases, the heaters are electrical components that are fully enclosed within the ducts or air-handling units and therefore do not support a pressure boundary function. Since the heaters do not perform a mechanical intended function they are not subject to AMR.

Cooling coil DMA-CC-51 has been spared in place; it has no heat transfer function, and is fully enclosed within the air-handling unit housing (DMA-AH-51). Therefore, the cooling coil is not subject to AMR.

Instrument tubing that is in scope for NSAS because it is attached to safety-related duct contains no liquid and does not provide structural support for those attached components. Therefore, this tubing is not required to maintain its structural integrity, since its failure cannot adversely affect connected or nearby safety-related components, and is not subject to AMR. All other instrument tubing is subject to AMR.

Table 2.3.3-14
Diesel Building HVAC Systems
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Air-handling unit housing	Pressure Boundary
Bolting	Pressure Boundary
Damper housing	Pressure Boundary
Drain pan	Structural Integrity
Duct	Pressure Boundary
Fan housing	Pressure Boundary
Flexible connection	Pressure Boundary
Heat exchanger (cooling coil headers)	Pressure Boundary
Heat exchanger (cooling coil fins)	Heat Transfer
Heat exchanger (cooling coil tubes)	Heat Transfer Pressure Boundary
Mechanical sealants	Pressure Boundary
Piping	Structural Integrity
Tubing	Pressure Boundary

2.3.3.15 Diesel Cooling Water (DCW) System

System Description

Each diesel generator set is serviced by an independent cooling system. These systems are located in separate rooms associated with their respective diesel generator. Each engine cooling water system is a closed water circuit that recirculates treated water for engine cooling. The treated water is circulated through the water-jacketed components of the engine to remove heat from the engine parts and the intake air. This jacket water heat is rejected through a shell and tube heat exchanger to the SW System.

The forced circulation of cooling water through the engine, lube oil cooler, heat exchanger, and heat exchanger bypass circuit is maintained by two engine-driven pumps. Separate bypass piping flow paths are provided to bypass the heat exchanger at low engine outlet temperatures and to heat the jacket water system during standby. During shutdown periods, an electric immersion heater is provided for standby heating. The engine can thus be kept in constant readiness for an immediate start.

Reason for Scope Determination

The DCW System provides cooling water to enable the emergency diesel generators to start, run, and load. This system-intended function is safety-related. Therefore, the DCW System meets the scoping criteria of 10 CFR 54.4(a)(1).

The DCW System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The DCW System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). Therefore, the DCW System does not meet the scoping criteria of 10 CFR 54.4(a)(2).

The DCW System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events.

FSAR References

Section 9.5.5 of the FSAR describes the Diesel Cooling Water System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M512-1, LR-M512-2, LR-M512-3

Components Subject to AMR

Table 2.3.3-15 lists the component types that require AMR and their intended functions.

Table 3.3.2-15, Aging Management Review Results – Diesel Cooling Water System, provides the results of the AMR.

The DCW expansion tank pressure cap and the DCW immersion heaters are replaced every other refueling outage, and are therefore short-lived and not subject to AMR.

The DCW jacket water pumps (DCW-P-1A1, 1A2, 1B1, 1B2, 2A1, 2A2, 2B1, 2B2, 1C, and 2C) are replaced on a 12-year cycle and are therefore short-lived and not subject to AMR.

Flexible connections (DCW-FLX-11, DCW-FLX-12) are replaced on a 12-year cycle, and are therefore short-lived and not subject to AMR. The remaining in-scope flexible connections for DCW are considered long-lived (not subject to periodic replacement), and are therefore subject to AMR.

Table 2.3.3-15
Diesel Cooling Water System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Pressure Boundary
Flexible connection	Pressure Boundary
Heat exchanger (channel, shell, and tubesheet)	Pressure Boundary
Heat exchanger (tubes)	Heat Transfer Pressure Boundary
Piping	Pressure Boundary
Sight glass	Pressure Boundary
Tank	Pressure Boundary
Tubing	Pressure Boundary
Valve body	Pressure Boundary

2.3.3.16 Diesel (Engine) Exhaust (DE) System

System Description

The DE System includes both the intake and exhaust for the diesel generator sets. The air intake trains associated with each diesel generator are housed in separate rooms and each is supplied air from the exterior of the diesel generator building (south side) through a screened air intake louver. Each engine air intake system consists of prefilters, an oil bath type air cleaner for the HPCS engine and a cartridge type for the engines associated with Diesel Generator sets 1 and 2, air turning box, the necessary piping, ductwork, and flexible connections to the inlet of the engine turbocharger and aftercooler. An in-line air intake silencer is also provided in the HPCS diesel engine air intake system.

The diesel exhaust trains associated with each diesel generator are housed in separate rooms. Each engine exhaust system consists of an exhaust manifold, turbocharger, exhaust silencer, and the necessary piping and ductwork. Exhaust piping from the diesel-driven air compressor in the HPCS starting air system is connected to the corresponding diesel exhaust line upstream of the exhaust silencer.

Exhaust gases are discharged through the turbocharger from the exhaust manifold and are expelled through ductwork and an exhaust silencer to the exterior of the Diesel Generator Building (north side).

Reason for Scope Determination

The DE System provides combustion air intake and exhaust for diesel engine operation. This system-intended function is safety-related. Therefore, the DCW System meets the scoping criteria of 10 CFR 54.4(a)(1).

The DE System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The DE System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). Therefore, the DE System does not meet the scoping criterion of 10 CFR 54.4(a)(2).

The DE System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events.

FSAR References

Section 9.5.8 of the FSAR describes the Diesel (Engine) Exhaust System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M512-1, LR-M512-2, LR-M512-3

Components Subject to AMR

Table 2.3.3-16 lists the component types that require AMR and their intended functions.

Table 3.3.2-16, Aging Management Review Results – Diesel (Engine) Exhaust System, provides the results of the AMR.

Component filter media in the DE System is replaced periodically as the media becomes fouled and is therefore short-lived, and not subject to AMR. The associated filter housings perform a pressure boundary function and are subject to AMR.

All ductwork within the DE System that is subject to AMR is evaluated as piping.

Table 2.3.3-16
Diesel (Engine) Exhaust System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary
Filter housing	Pressure Boundary
Flexible connection	Pressure Boundary
Heat exchanger (cover and shell)	Pressure Boundary
Heat exchanger (tubes)	Heat Transfer Pressure Boundary
Piping	Pressure Boundary
Pump casing (turbocharger)	Pressure Boundary
Silencer (exhaust and intake)	Pressure Boundary
Tubing	Pressure Boundary
Valve body	Pressure Boundary

2.3.3.17 Diesel Engine Starting Air (DSA) System

System Description

The DSA System is designed to provide a reliable method for automatically starting each diesel generator unit. The starting air systems for Diesel Generators 1 and 2 consist of two electric-motor-driven air compressors, eight air receivers, and associated piping and controls. The HPCS starting air system has two separate air supply trains: one supplied by a diesel-driven compressor and the other by an electric-motor-driven compressor. The starting air system on each engine consists of four air start motors.

Reason for Scope Determination

The DSA System provides air to the air start motors to enable the emergency diesel generators to start, run, and load. This system-intended function is safety-related. Therefore, the DSA System meets the scoping criteria of 10 CFR 54.4(a)(1).

The DSA System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The DSA System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the DSA System meets the scoping criteria of 10 CFR 54.4(a)(2).

The DSA System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events.

FSAR References

Section 9.5.6 of the FSAR describes the Diesel Engine Starting Air System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M512-1, LR-M512-2, LR-M512-3

Components Subject to AMR

Table 2.3.3-17 lists the component types that require AMR and their intended functions.

Table 3.3.2-17, Aging Management Review Results – Diesel Engine Starting Air System, provides the results of the AMR.

Component filter media in the DSA System is replaced periodically as the media becomes fouled, and is therefore short-lived and not subject to AMR.

The DSA diesel air start motors are replaced every other refueling outage, and are therefore short-lived and not subject to AMR.

The DSA high pressure flexible connections (DSA-FLX-11C1/C2, 12C1/C2) are replaced on a 12-year cycle, and are therefore short-lived and not subject to AMR. The remaining in-scope flexible connections for DSA, between the air receivers and the Division 3 diesel (DSA-FLX-1A/B), are long-lived (not subject to periodic replacement), and are therefore subject to AMR.

Table 2.3.3-17
Diesel Engine Starting Air System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Compressor casing	Structural Integrity
Filter body	Structural Integrity
Flexible connection	Pressure Boundary
Heat exchanger (tubes)	Structural Integrity
Oil fog lubricator	Pressure Boundary Spray
Piping	Pressure Boundary Structural Integrity
Strainer (body)	Pressure Boundary
Strainer (screen)	Filtration
Tank (air receivers)	Pressure Boundary
Tank (air dryers)	Structural Integrity
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.18 Diesel Fuel Oil (DO) System

System Description

The DO System consists of separate, independent diesel oil supply systems serving each of the diesel generators. Each of these systems consists of a fuel oil storage tank, a transfer pump, a day tank, interconnecting piping and valves, and associated instruments and controls.

The auxiliary boiler fuel oil storage tank (FO-TK-1) is used as an additional storage tank for the emergency diesel generator fuel oil storage and transfer system. This tank is maintained to the same cleanliness requirements as the other Class I fuel oil tanks. The diesel fuel oil stored in this tank is surveyed to the same requirements as the fuel oil in the other diesel storage tanks.

The fuel oil supply from the day tanks to each diesel engine consists of two mutually redundant systems. Either system is capable of supplying fuel oil to the engine. Each system contains a fuel oil supply line strainer, fuel oil pump, duplex filter, pressure gauge, and relief and check valves.

One of the fuel oil supply pumps is mechanically driven by the engine and is normally used during engine operation. The other supply pump is driven by a 120-V DC motor and is used to fill the fuel oil system and fuel header prior to initial operation and after maintenance has been performed on system piping and components. The DC-motor-driven pump runs during engine operation in the event fuel supply through the engine-driven pump system fails.

Reason for Scope Determination

The DO System provides fuel oil to enable the emergency diesel generators to start, run, and load. This system-intended function is safety-related. Therefore, the DO System meets the scoping criteria of 10 CFR 54.4(a)(1).

The DO System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The DO System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the DO System meets the scoping criteria of 10 CFR 54.4(a)(2).

The DO System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events.

FSAR References

Section 9.5.4 of the FSAR describes the Diesel Fuel Oil System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M512-1, LR-M512-2, LR-M512-3, LR-M512-4, LR-M513

A section of Fuel Oil (FO) piping that connects to the fuel oil storage tank (FO-TK-1) is attached to safety-related DO piping. The attached piping is anchored by a concrete pad as it exits from the ground. For the purpose of AMR, the buried portion of the FO piping is evaluated as part of the DO System.

Components Subject to AMR

Table 2.3.3-18 lists the component types that require AMR and their intended functions.

Table 3.3.2-18, Aging Management Review Results – Diesel Fuel Oil System, provides the results of the AMR.

Component filter media in the DO System is replaced periodically as the media becomes fouled, and is therefore short-lived and not subject to AMR. The associated filter bodies in the DO System perform a pressure boundary function and are subject to AMR.

The DO engine-driven and DC-motor-driven fuel oil pumps are replaced on a 12-year cycle and are therefore short-lived and not subject to AMR.

The NSR piping inside the DO fuel oil storage tanks that is attached to safety-related piping does not provide support or fulfill a structural integrity function. Therefore, this section of piping is not subject to AMR.

Flexible connections (DO-FLX-20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34) are replaced on a 12-year cycle and are therefore short-lived and not subject to AMR. The remaining in-scope flexible connections for DO are long-lived (not subject to periodic replacement), and are therefore subject to AMR.

The DO System contains NSR piping, anchored by the filter polisher skid (DO-FP-1), that is directly connected to safety-related piping. The connected sections of piping are buried underground, with the NSR piping passing through a concrete pad before becoming exposed at the filter polisher skid. For NSR components connected to safety-related components, the NSR components and their supports, up to and including the first equivalent anchor (or attachment to a major component) are within the scope of license renewal. However, failure of the above-ground portion of the attached

NSR piping would not prevent the DO System from providing fuel oil to the emergency diesel generators. The exposed portion of NSR piping is at a higher elevation than the fuel oil tanks thus preventing leakage from the tanks. Failure of the above-ground portion of the NSR piping will not transmit forces to the fuel oil tanks that would prevent the DO System from fulfilling its intended function. Therefore, the above-ground portion of the attached NSR piping, up to and including the filter polisher skid, is not subject to AMR.

Table 2.3.3-18
Diesel Fuel Oil System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Filter body	Pressure Boundary
Flame arrestor	Structural Integrity
Flexible connection	Pressure Boundary
Orifice	Pressure Boundary Throttling
Piping	Pressure Boundary Structural Integrity
Pump casing	Pressure Boundary
Strainer (body and screen)	Filtration Pressure Boundary
Tank	Pressure Boundary
Tubing	Pressure Boundary
Valve body	Pressure Boundary Structural Integrity

2.3.3.19 Diesel Generator (DG) System

System Description

The DG System, which is the standby AC power source for the plant, consists of three diesel generator sets, each one serving ESF loads in its associated division (1, 2, 3), their attendant air starting and fuel supply systems, and automatic control circuitry. The diesel generator sets supply power to those electrical loads that are required to achieve safe cold shutdown of the plant or to mitigate the consequences of a design basis event coincident with a loss of all offsite AC power. Diesel generator sets 1 and 2 (Divisions 1 and 2) have two engines each, while diesel generator set 3 (the HPCS diesel, Division 3) has one engine.

The dual drive diesel generators comprising the Division 1 and 2 standby AC power supplies start immediately upon receipt of 4.16-kV Class 1E bus undervoltage or plant LOCA signals and are designed to quickly restore onsite power to their respective Class 1E distribution system divisions.

The HPCS standby power source is designed to supply the power required for Division 3 emergency core cooling (water spray) in the event of a LOCA. The HPCS diesel generator starts automatically on receipt of 4.16-kV HPCS bus undervoltage or plant LOCA signals.

Each diesel generator set is divided into the following major systems for the purpose of evaluation:

Cooling Water Systems – The diesel generator cooling water systems are discussed in Section 2.3.3.15.

Lubrication Systems – The diesel generator lubrication systems, excluding the generator bearing lube oil tank and associated sight glass, are discussed in Section 2.3.3.20.

Air Starting Systems – The diesel generator air starting systems are discussed in Section 2.3.3.17.

Fuel Oil Systems – The diesel generator fuel oil storage and transfer systems are discussed in Section 2.3.3.18.

Intake Air and Exhaust Systems – The diesel generator intake and exhaust systems are discussed in Section 2.3.3.16.

Reason for Scope Determination

The DG System provides emergency power to safety-related equipment. This system-intended function is safety-related. Therefore, the DG System meets the scoping criteria of 10 CFR 54.4(a)(1).

The DG System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The DG System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). Therefore, the DG System does not meet the scoping criteria of 10 CFR 54.4(a)(2).

The DG System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events.

FSAR References

Sections 8.3.1.1.7 and 8.1.5.2 of the FSAR describe the Standby Alternating Current Power System and the Onsite Electrical Power System, respectively. These systems are evaluated as the Diesel Generator System for license renewal.

License Renewal Drawings

The DG System is not depicted on any license renewal drawing.

Components Subject to AMR

Table 2.3.3-19 lists the component types that require AMR and their intended functions.

Table 3.3.2-19, Aging Management Review Results – Diesel Generator System, provides the results of the AMR.

The DG System diesel engines and generators are active components and not subject to AMR. The diesel engine boundary extends to the interfaces with the Diesel Cooling Water, Diesel (Engine) Exhaust, Diesel Engine Starting Air, Diesel Fuel Oil, and Diesel Lubricating Oil systems. The diesel engine boundary includes the engine, intake and exhaust manifolds, lube oil pan (crankcase), and the fuel injectors.

Table 2.3.3-19
Diesel Generator System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary
Piping	Pressure Boundary
Sight glass (generator bearing lube oil tank)	Pressure Boundary
Tank (generator bearing lube oil tank)	Pressure Boundary

2.3.3.20 Diesel Lubricating Oil (DLO) System

System Description

The DLO System, one for each diesel generator, is designed to provide sufficient lubrication for proper operation of its associated diesel generator under all loading conditions. The system is required to circulate the lube oil to the diesel engine working surfaces and to remove excess heat generated by friction during operation.

The lubrication system for each diesel generator is a combination of three separate systems. These are the main lubricating oil system, the piston cooling system, and the scavenging oil system. Each lubrication system has its own pump.

The main lubricating pump supplies oil under pressure to the various moving parts of the engine. The piston cooling pump supplies oil for the cooling of the pistons and lubrication of the piston pin bearing surfaces. After circulation through the engine parts, the lubricating oil flows back to the engine oil sump. The scavenging oil pump takes suction from the engine oil sump and pumps this oil through a filter and lube oil cooler to the strainer sump, which supplies the main and piston lubricating pumps.

The lubrication system on each engine also has three small lube oil pumps to circulate oil through the engine main bearings and the turbocharger bearings to minimize wear during engine starts.

Reason for Scope Determination

The DLO System provides cooling and lubrication of diesel engine parts to enable the emergency diesel generators to start, run, and load. This system-intended function is safety-related. Therefore, the DLO System meets the scoping criteria of 10 CFR 54.4(a)(1).

The DLO System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The DLO System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). Therefore, the DLO System does not meet the scoping criteria of 10 CFR 54.4(a)(2).

The DLO System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events.

FSAR References

Section 9.5.7 of the FSAR describes the Diesel Lubricating Oil System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M512-1, LR-M512-2, LR-M512-3

Components Subject to AMR

Table 2.3.3-20 lists the component types that require AMR and their intended functions.

Table 3.3.2-20, Aging Management Review Results – Diesel Lubricating Oil System, provides the results of the AMR.

Component filter media in the DLO System is replaced periodically as the media becomes fouled, and is therefore short-lived and not subject to AMR. The associated filter bodies in the DLO System perform a pressure boundary function and are subject to AMR.

Flexible connections (DLO-FLX-1, 2, 3, 4, 5, 6, 8, 9, 12, 13) are replaced on a 12-year cycle, and are therefore short-lived and not subject to AMR. The remaining in-scope flexible connections for DLO are long-lived (not subject to periodic replacement), and are therefore subject to AMR.

Table 2.3.3-20
Diesel Lubricating Oil System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary
Filter body	Pressure Boundary
Flexible connection	Pressure Boundary
Heat exchanger (channel and shell)	Pressure Boundary
Heat exchanger (tubes)	Heat Transfer Pressure Boundary
Orifice	Pressure Boundary Throttling
Piping	Pressure Boundary
Pump casing	Pressure Boundary
Sight glass	Pressure Boundary
Strainer (body and screen)	Filtration Pressure Boundary
Tubing	Pressure Boundary
Valve body	Pressure Boundary

2.3.3.21 Equipment Drains Radioactive (EDR) System

System Description

The EDR System consists of equipment drain subsystems in the Reactor, Turbine, and Radwaste Buildings. Each of the subsystems is discussed below.

Reactor Building Equipment Drains - Reactor Building equipment drains are collected in two separate subsystems. One subsystem handles drainage from all equipment drains located in the Primary Containment. The other handles drainage from equipment drains located in the remaining portions of the Reactor Building.

The primary containment equipment drain subsystem starts at funnel drains located at pieces of equipment, collects in branch lines, and discharges to the drywell equipment drain sump. The drywell equipment drain sump is drained through a 3-inch line penetrating the containment wall to the Reactor Building equipment drain sump. The drain line is provided with a loop seal to prevent gas flow between the drywell and the Reactor Building during normal operation, and two isolation valves located outside the drywell.

The equipment drains for the remainder of the Reactor Building start at funnel drains located at pieces of equipment, collect in branch lines, and discharge to the Reactor Building equipment drain sump. Two sump pumps are installed in the Reactor Building equipment drain sump to transfer the collected water to the selected collector tank located in the Radwaste Building. To minimize the release of radioactive contaminants, the Reactor Building equipment drain sump and drain headers are maintained at a negative pressure and vented through a filter system. This filter system, which is a part of the Reactor Building Exhaust (REA) System, is not within the scope of license renewal.

Turbine Building Equipment Drains - The Turbine Building equipment drain sumps serve as the collection point for equipment drains from all floors of the Turbine Building. The equipment drains start at funnel drains located at pieces of equipment, collect in branch lines, and discharge to one of two Turbine Building equipment drain sumps. Two sump pumps are installed in each Turbine Building equipment drain sump. These pumps transfer the collected water to the waste collector tank located in the Radwaste Building.

Radwaste Building Equipment Drains - The Radwaste Building equipment drainage subsystem collects drainage from components in a separate equipment drain sump. The sump contains a sump pump that transfers the collected water to the waste collector tank. To minimize the release of radioactive contaminants, the Radwaste Building equipment drain sump and drain header are maintained at a negative pressure and vented to the Radwaste Building Ventilation System. This part of the Radwaste Building Ventilation System is not within the scope of license renewal.

Reason for Scope Determination

The EDR System provides Primary Containment isolation and integrity (including valve position indication), and secondary containment isolation and integrity (including valve position indication). These system-intended functions are safety-related. Therefore, the EDR System meet the scoping criteria of 10 CFR 54.4(a)(1).

The EDR System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The EDR System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the EDR System meets the scoping criteria of 10 CFR 54.4(a)(2).

The EDR System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Section 9.3.3.2.1 of the FSAR describes the Radioactive Equipment Drainage System, evaluated for license renewal as the Equipment Drains Radioactive System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M521-2, LR-M523-2, LR-M537, LR-M539

Components Subject to AMR

Table 2.3.3-21 lists the component types that require AMR and their intended functions.

Table 3.3.2-21, Aging Management Review Results – Equipment Drains Radioactive System, provides the results of the AMR.

Solenoid pilot valves and the associated air lines provide a control air supply to actuators for the primary and secondary containment isolation valves (EDR-V-19, EDR-V-20, EDR-V-394, and EDR-V-395). Failure of the air supply places the valve in a safe position that supports the system function. Therefore, pressure boundary integrity is not a required component intended function of these solenoid valves, air supply lines, or actuators for the system to perform its intended function. Since these components have no other component intended function, they are not subject to AMR.

The external subcomponents (shell and channel covers) of the in-scope heat exchangers will contain fluid leakage in the event of a failure of an internal subcomponent (tubes and tubesheet). Failure of an internal subcomponent will therefore not create the potential for spatial interaction that could prevent a safety-related SSC from performing its intended function. As a result, the internal subcomponents (tubes and tubesheet) of the in-scope heat exchangers are not subject to AMR.

Table 2.3.3-21
Equipment Drains Radioactive System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Pressure Boundary Structural Integrity
Heat exchanger (channel and shell)	Structural Integrity
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Sight glass	Structural Integrity
Tubing	Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.22 Fire Protection (FP) System

System Description

The FP System consists of the following:

Fire Protection Water Supply System - The fire protection water supply system consists of a primary fire water supply, a secondary fire water supply, and yard mains to distribute water to the yard hydrant isolation valves and building standpipes. The primary fire protection water supply is drawn from the circulating water basin by three fire pumps: two electric (FP-P-2A and FP-P-2B) and one diesel driven (FP-P-1). The primary fire pump discharge lines are piped so that the three primary fire pumps discharge to the underground fire main loop.

The secondary water supply is drawn from a 400,000-gallon embankment-supported bladder tank (FP-TK-110) with a dedicated water supply of 284,640 gallons. The secondary water supply is delivered to the fire main loop by a diesel driven fire pump (FP-P-110) located in the Water Filtration Building. The secondary water supply connects to the fire loop through a 10-inch branch line. A pressure maintenance jockey pump (primary water supply jockey pump (FP-P-3) or secondary water supply jockey pump (FP-P-111)) is normally running to maintain system pressure.

One or multiple fire pumps will start if the other running fire pumps cannot maintain system pressure. First, the electric motor pumps will start in sequential order. Then, the diesel driven fire pumps will start to maintain system pressure.

Fire protection water is distributed through a 12-inch underground fire main to supply station hydrants, fire hose stations, and suppression systems. The looped arrangement of the fire protection system ensures continued flow to the remainder of the system when sections of the system are isolated for tests or repairs. Post indicator valves sectionalize the yard loop to increase the reliability of fire protection water supply in case of a fire main break.

Wet Pipe Sprinkler Systems - Wet pipe sprinkler systems are installed to provide automatic fire suppression of general area hazards. Wet pipe sprinklers consist of closed sprinklers attached to piping that contains water under pressure at all times. System operation is initiated when the local temperature rise from a fire reaches the operating temperature of fusible link sprinkler heads. Water discharge allows the hinged clapper in the alarm check valve to open. Valve operation provides remote alarm and indication in the main control room.

Preaction Sprinkler Systems - Preaction systems are used in areas where inadvertent operation of the sprinklers could damage or cause outages of vital electrical equipment. Preaction systems are installed in the cable spreading room and cable chase in the

Radwaste Building, the Reactor-Radwaste corridor, the Diesel Generator Building, and the Reactor Recirculation Pump Adjustable Speed Drive Building.

The preaction systems have closed fusible link sprinkler heads. Downstream of the control valve, the preaction sprinkler piping is normally dry and pressurized with air to supervise piping system integrity. Low air system pressure, which could indicate damaged piping or sprinkler heads, is alarmed in the control room. Fire detectors located in the protected area activate a solenoid valve to open the deluge valve, supplying water to fill and pressurize the sprinkler system piping. Pull stations are also provided to allow manual operation of the preaction system. Sprinkler flow is not initiated until the local temperature increases to the operating temperature of the closed fusible link sprinkler heads.

Deluge Water Spray Systems - Deluge water spray systems are used where fast response may be required to control or extinguish a fire. A deluge system employs open nozzles attached to a normally dry piping system. Fire detectors located in the hazard area activate a solenoid valve to open the deluge valve and initiate water flow.

Deluge water spray systems provide automatic fire protection for various locations in the Turbine Generator Building where oil is stored or piped, for yard transformers, and for the reactor feed pump rooms in the Turbine Generator Building.

Manually actuated deluge water spray systems are installed to protect charcoal filters in certain HVAC filter units. High temperature signals are used to alarm control room operators to potential fire conditions.

Carbon Dioxide Fire Suppression Systems - The low pressure carbon dioxide system automatically provides fire protection for the turbine generator exciter housing. A manual carbon dioxide hose station, with reel and hose, is also provided for exciter housing protection on the turbine operating floor. The carbon dioxide storage tank also provides carbon dioxide for generator purging during startup and shutdown conditions. Interlocks are provided such that the generator purge system cannot draw down tank level below that needed for automatic fire protection of the exciter housing.

Thermal detectors located in the generator exciter housing provide early warning alarm in the main control room allowing the operator to review and evaluate the problem prior to manual or automatic actuation of the system. Automatic operation of the carbon dioxide system is initiated when the temperature increases to the set point of the high temperature detector. The system can be manually actuated by a break glass station located near the carbon dioxide protected area. An automatic timer regulates the carbon dioxide discharge for both automatic and manual operation to provide even distribution of the discharge.

Halon 1301 Suppression Systems - Halon 1301 suppression systems are installed in normally occupied areas where the application of water would be inappropriate. Halon

1301 provides automatic fire protection for the main control room Power Generation Control Cabinet (PGCC) under-floor areas.

Eighteen Halon 1301 systems are installed in the various main control room PGCC sub-floor duct sections to discharge on activation of their associated thermal detector units. Thermal detector operation also causes a local alarm and indication on the main control room fire control panel. Smoke detectors are located in each PGCC section to provide early warning alarm. Each system includes supervision features that actuate a trouble alarm and indication on the main control room fire control panel in case of a wiring or component failure.

Dry Chemical Fire Suppression System – A dry chemical suppression system is installed in approved portable hazardous material storage buildings within the plant. The system automatically actuates by melting of the fusible links or manually by a local pull station.

Reason for Scope Determination

The Fire Protection System provides isolation of the fire water supply to the SGT System filter units and to the Radwaste Building Mixed Air System emergency filter units. These system-intended functions are safety-related. Therefore, the Fire Protection System meets the scoping criteria of 10 CFR 54.4(a)(1).

The Fire Protection System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The Fire Protection System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the Fire Protection System meets the scoping criteria of 10 CFR 54.4(a)(2).

The Fire Protection System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) regulated event.

FSAR References

Section F.2.4 of the FSAR describes the Fire Suppression Systems, evaluated for license renewal as the Fire Protection System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M515-1, LR-M515-2, LR-M515-4, LR-M515-5, LR-M573-2, LR-M544, LR-M545-3, LR-M548-1

The Carbon Dioxide and Dry Chemical Fire Suppression systems do not contain components that perform a license renewal intended function, and therefore are not within the scope of license renewal.

The diesel fuel oil lines that supply fuel oil to the fire protection pump diesels, designated as DO on the drawings, and the fire protection pump diesel engine exhaust piping, designated as DE on the drawings, are within the evaluation boundaries of the Fire Protection System.

Components Subject to AMR

Table 2.3.3-22 lists the component types that require AMR and their intended functions.

Table 3.3.2-22, Aging Management Review Results – Fire Protection System, provides the results of the AMR.

Portable fire extinguishers are within the scope of license renewal. However, they are periodically inspected and hydrostatically tested, and are replaced if they do not pass an inspection or test. Portable fire extinguishers are short-lived components, subject to replacement based on a qualified life or specified time period, and not subject to AMR.

Fire and smoke detectors, and alarm devices, do not perform a passive mechanical function for the purpose of license renewal. Electrical components that are subject to AMR (the cables for the detectors and alarms) are addressed in Section 2.5.

Fire barriers, fire dampers, fire doors, and fire penetration seals determined to be within the scope of license renewal and subject to AMR are addressed as structural commodities in Section 2.4.13.

Fire hoses are within the scope of license renewal. However, they are periodically inspected to ensure that they are in an acceptable operating condition. These ongoing hose station inspections (together with the associated action to repair or replace any fire hose noted to be in a deteriorated condition) establish a qualified life for the hoses. Therefore, the fire hoses are not subject to AMR.

The pre-action sprinkler systems are connected to the Control Air System. A failure of the air system will place the sprinkler system in a safe position. That is, the fusible link closed sprinkler heads will maintain water inventory in the piping and the sprinkler system will still be able to perform its system-intended function. Therefore, since this portion of the Control Air System, and associated components, does not have any other component intended function, the portion of the air system included within the Fire Protection System boundary is not subject to AMR.

The diesel engines, except for the attached heat exchanger, are evaluated as active components and not subject to AMR.

The jockey pumps are not essential fire protection equipment per Columbia Licensee Controlled Specifications (LCS) 1.10.1. Therefore, since the jockey pumps do not have a component intended function, they are not subject to AMR.

Halon cylinders are within the scope of license renewal. The principal design criterion for these bottles is Department of Transportation Standards. The halon cylinders comply with the requirements of the DOT standards. The halon cylinders are consumables, replaced periodically in accordance with DOT standards, and are not subject to AMR.

The Fire Protection bladder tank (FP-TK-110) is within the scope of license renewal. However, it has a service life of approximately 20 years and was replaced accordingly in 2008. The replacement tank is of a similar design, with the same limited service life, and is subject to inspections to ensure its timely replacement. The bladder tank is short-lived, subject to replacement based on a qualified life or specified time period, and is not subject to AMR.

Table 2.3.3-22
Fire Protection System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Exhaust silencer	Pressure Boundary
Flexible connection	Pressure Boundary
Heat exchanger (shell)	Pressure Boundary
Heat exchanger (tubes)	Heat Transfer Pressure Boundary
Hydrant	Pressure Boundary
Orifice	Pressure Boundary Throttling
Piping	Pressure Boundary Structural Integrity
Pump casing	Pressure Boundary
Spray nozzle	Pressure Boundary Spray
Sight glass	Pressure Boundary
Strainer (body and screen)	Filtration Pressure Boundary
Tank	Pressure Boundary
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.23 Floor Drain (FD) System

System Description

The FD System consists of non-radioactive floor drain subsystems in the Service Building and Turbine Building.

Floor drains from normally uncontaminated areas of the Turbine Building are collected in three sumps. All three sumps are routed to the Radwaste System for processing.

Floor drains in the Service Building are collected in a single sump containing two sump pumps. Water collected in the Service Building floor drain sump is pumped to the storm water drainage system. Water collected by the storm water drainage system is conveyed by a concrete pipe to a point approximately 1,500 feet northeast of the plant. The pipe discharges to an earthen channel that carries the water to a small unlined evaporation and percolation pond. Roof drains, which are evaluated as part of the FD System, are drained by gravity or pumped to the storm drain system.

Reason for Scope Determination

The FD System contains components designated as safety-related by Columbia choice. Therefore, the FD System meets the scoping criteria of 10 CFR 54.4(a)(1).

The FD System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The FD System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the FD System meets the scoping criteria of 10 CFR 54.4(a)(2).

The FD System is not relied upon to demonstrate compliance with any regulated event and does not meet the 10 CFR 54.4(a)(3) scoping criteria.

FSAR References

Section 9.3.3.2.3 of the FSAR describes the Nonradioactive Water Drainage System, and the Roof Drain System, evaluated collectively for license renewal as the Floor Drain System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M539, LR-M540, LR-M788-1, LR-M852, LR-216-01,3682

Components Subject to AMR

Table 2.3.3-23 lists the component types that require AMR and their intended functions.

Table 3.3.2-23, Aging Management Review Results – Floor Drain System, provides the results of the AMR.

Table 2.3.3-23
Floor Drain System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary

2.3.3.24 Floor Drain Radioactive (FDR) System

System Description

The FDR System consists of floor drain subsystems in the Reactor, Turbine, and Radwaste Buildings. Each of the subsystems is discussed below.

Reactor Building Floor Drains - Reactor Building floor drainage is collected in two separate systems. One handles drainage from the drywell and the other handles drainage from all floor drains located in the remaining portions of the Reactor Building.

The drywell floor drains subsystem collects leakage in the drywell from piping, valves, and equipment in the drywell floor drain sump. In addition, drains from the drywell coolers are routed to this sump. The drywell floor drain sump is drained through a 3-inch line penetrating the containment wall to one of the Reactor Building floor drain sumps. This drain line includes two isolation valves located outside the containment and an in-line flow meter for monitoring the flow from the drywell sump during reactor operation. The drain line is provided with a loop seal to prevent gas flow between the drywell and the Reactor Building during normal operation.

The floor drain system for the Reactor Building contains four sumps. Each sump is located near one of the four corners of the building and collects drainage from roughly one quarter of the building. Two of the Reactor Building floor drain sumps are provided with one sump pump. The other two sumps have two pumps, one of which is for backup. The Reactor Building floor drain pumps transfer the collected water to the floor drain collector tank located in the Radwaste Building. To minimize the release of radioactive contaminants the Reactor Building floor drain sumps and drain headers are maintained at a negative pressure and vented through a filter system.

Turbine Building Floor Drains - Turbine Building radioactive floor drains are collected in two sumps located in the Turbine Building. Each sump is equipped with two sump pumps. Floor drain water collected in these sumps is pumped to the floor drain collector tank in the Radwaste Building for processing.

Radwaste Building Floor Drains - Three sumps collect radioactive floor drains and equipment drains and overflows from equipment containing water of low purity. Two of these sumps pump to the floor drain collector tank. The remaining sump, which collects drainage from the solid waste handling area, discharges to the waste sludge phase separator.

Reason for Scope Determination

The FDR System provides Primary Containment isolation and integrity (related to FDR-V-3 and FDR-V-4), secondary containment isolation and integrity (related to FDR-V-219, -220, -221, and -222), Regulatory Guide 1.97 Category 1 indication (ECCS pump room flood detection), and Primary Containment isolation valve position indication (for

FDR-V-3 and FDR-V-4). These system-intended functions are safety-related. Therefore, the FDR System meets the scoping criteria of 10 CFR 54.4(a)(1).

The FDR System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The FDR System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the FDR System meets the scoping criteria of 10 CFR 54.4(a)(2).

The FDR System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Section 9.3.3.2.2 of the FSAR describes the Radioactive Floor Drainage Subsystem, evaluated for license renewal as the Floor Drain Radioactive System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M539

Components Subject to AMR

Table 2.3.3-24 lists the component types that require AMR and their intended functions.

Table 3.3.2-24, Aging Management Review Results – Floor Drain Radioactive System, provides the results of the AMR.

Solenoid pilot valves and associated air lines provide a control air supply to actuators for the primary and secondary containment isolation valves (FDR-V-3, 4, and 219 through 222). Failure of the air supply places the valve in a safe position that supports the system function. Therefore, pressure boundary integrity is not a required component intended function of these solenoid valves, air supply lines, or actuators for the system to perform its intended function. Since these components have no other component intended function, they are not subject to AMR.

Spectacle flanges (FDR-SF-1 and 2) are normally open. As such the spectacle does not perform any license renewal function and is not subject to AMR. The flange portion of the component is evaluated as piping.

Table 2.3.3-24
Floor Drain Radioactive System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Tubing	Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.25 Fuel Pool Cooling (FPC) System

System Description

The FPC System consists of two separate trains, each containing a circulating pump and a heat exchanger. The system also contains two filter demineralizers and two skimmer surge tanks, as well as the required piping, valves, and instrumentation. Except for the pumps, heat exchangers and filter demineralizers, common piping headers are used. The FPC pumps normally circulate the fuel pool water in a closed loop, taking suction from the surge tanks, circulating the water through a heat exchanger and a filter demineralizer, and discharging it through the diffusers at the bottom of the fuel pool. During refueling, fuel pool water is discharged through the fuel pool diffusers or through diffusers in the reactor well. Makeup water for the system is normally transferred from the condensate storage tank to a skimmer surge tank to make up fuel pool water losses.

The FPC System must operate in a variety of conditions. During normal reactor operations the FPC provides for cooling and cleaning of the spent fuel pool containing discharged fuel assemblies. During refueling outages, the FPC System may be required to provide additional decay heat removal. This heat removal function can be provided by operating both trains of FPC or, in the event of a full core offload, by using RHR System loop “B” in an assist mode. The RHR B loop can be cross connected to the FPC System. In addition, with the reactor cavity flooded and fuel pool gates removed, RHR loop A or B may be lined up to take suction from the surge tanks and discharge to the RPV. The system is designed to dissipate the fuel pool heat load during normal operation and refueling conditions.

In addition to fuel pool water demineralization, the FPC System may be used to mix and demineralize the suppression pool water. The suppression pool cleanup portion of the system may also be used to periodically let down suppression pool water inventory.

Reason for Scope Determination

The FPC System provides spent fuel pool cooling and level control, Primary Containment isolation and integrity, and secondary containment isolation and integrity. These system-intended functions are safety-related. Therefore, the FPC System meet the scoping criteria of 10 CFR 54.4(a)(1).

The FPC System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The FPC System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the FPC System meets the scoping criteria of 10 CFR 54.4(a)(2).

The FPC System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Section 9.1.3 of the FSAR describes the Spent Fuel Pool Cooling and Cleanup System, evaluated for license renewal as the Fuel Pool Cooling System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M526-1, LR-M526-2

Components Subject to AMR

Table 2.3.3-25 lists the component types that require AMR and their intended functions.

Table 3.3.2-25, Aging Management Review Results – Fuel Pool Cooling System, provides the results of the AMR.

The spent fuel storage pool is evaluated with the Reactor Building (see Section 2.4.2).

**Table 2.3.3-25
Fuel Pool Cooling System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Heat exchanger (channel, shell, and tubesheet)	Pressure Boundary
Heat exchanger (tubes)	Heat Transfer Pressure Boundary
Orifice	Pressure Boundary Throttling
Piping	Pressure Boundary Structural Integrity
Pump casing	Pressure Boundary Structural Integrity
Screen	Filtration
Strainer	Filtration Pressure Boundary
Tank (skimmer surge tank)	Pressure Boundary
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.26 Leak Detection (LD) System

System Description

The LD System consists of temperature, pressure, and flow sensors with associated instrumentation and alarms. This system detects, annunciates, and isolates (in certain cases) leakages in the main steam lines, the Reactor Water Cleanup System, the RHR System, the RCIC System, the Reactor Feedwater System, the HPCS System, the LPCS System, and coolant systems within the Primary Containment.

Small leaks generally are detected by temperature and pressure changes, and drain sump pump activities. Large leaks are detected by changes in reactor water level and changes in flow rates in process lines.

Reason for Scope Determination

The LD System monitors leakage from the reactor coolant pressure boundary, and initiates alarms or isolation signals when predetermined limits are exceeded. These system-intended functions are safety-related. Therefore, the LD System meets the scoping criteria of 10 CFR 54.4(a)(1).

The LD System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The LD System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the LD System meets the scoping criteria of 10 CFR 54.4(a)(2).

The LD System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Section 5.2.5 of the FSAR describes the Nuclear Boiler Leak Detection System, evaluated for license renewal as the Leak Detection System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M539

LD System components located within Reactor Recirculation System piping are evaluated as part of the reactor coolant pressure boundary in Section 2.3.1.3.

The RCIC, RHR, and Main Steam system components that provide input to the LD System are included within the system evaluation boundaries of their respective systems.

Components Subject to AMR

The only LD components that are within the scope of license renewal are level switches (FDR-LS-41 through 46), temperature elements, and temperature monitors. Since these are instruments that are specifically excluded in 10 CFR 54.21(a)(1)(i) from AMR, there are no LD components that are subject to AMR.

2.3.3.27 Miscellaneous Waste Radioactive (MWR) System

System Description

The MWR System is designed to collect water in the Reactor, Turbine, and Radwaste buildings that can contain potentially radioactive detergent and transfer the fluid directly by gravity to the Radwaste Building sump or the detergent drain tanks. It is also used to drain the decontamination solution in the Reactor Building from the decontamination pit and Reactor Closed Cooling Water chemical addition tank to the chemical waste tanks. Additionally the system also consists of SLC System drains. These equipment and floor drains collect borated water from the SLC System and direct it to 55-gallon drums located in the Reactor Building.

Reason for Scope Determination

The MWR System provides Primary Containment isolation and integrity, and secondary containment isolation and integrity. These system-intended functions are safety-related. Therefore, the MWR System meet the scoping criteria of 10 CFR 54.4(a)(1).

The MWR System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The MWR System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the MWR System meets the scoping criteria of 10 CFR 54.4(a)(2).

The MWR System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 11.2 of the FSAR describes the Liquid Waste Management System, evaluated for license renewal as the MWR System

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M539

Components Subject to AMR

Table 2.3.3-26 lists the component types that require AMR and their intended functions.

Table 3.3.2-26, Aging Management Review Results – Miscellaneous Waste Radioactive System, provides the results of the AMR.

The 55-gallon drums that receive drainage from the Standby Liquid Control area are a short-lived commodity, and as such are not subject to AMR.

Table 2.3.3-26
Miscellaneous Waste Radioactive System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.28 Plant Sanitary Drains (PSD) System

System Description

All non-contaminated sanitary waste from the site buildings is directed into the PSD System. All sanitary drains in the plant are collected into a main sewage header that leaves the plant building complex, below grade, from the Service Building. All waste lines are vented to the atmosphere via roof vents in accordance with applicable codes except those in the Reactor Building, which are vented to the main Reactor Building exhaust system, and those in the main control room, which are vented to the main control room exhaust system.

Reason for Scope Determination

The PSD System does not perform any safety-related system intended functions that meet the scoping criteria of 10 CFR 54.4(a)(1).

The PSD System contains NSR components that perform a 10 CFR 54.4(a)(1) function to maintain the control room pressure envelope. This system-intended function is an NSAS function. The PSD System also contains NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the PSD System meets the scoping criteria of 10 CFR 54.4(a)(2).

The PSD System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 9.2.4.2.2 of the FSAR describes the Sanitary Drain System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-P542

Components Subject to AMR

Table 2.3.3-27 lists the component types that require AMR and their intended functions.

Table 3.3.2-27, Aging Management Review Results – Plant Sanitary Drains System, provides the results of the AMR.

Table 2.3.3-27
Plant Sanitary Drains System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Structural Integrity
Piping	Pressure Boundary Structural Integrity

2.3.3.29 Plant Service Water (TSW) System

System Description

The TSW System consists of two 100% capacity pumps taking suction from the circulating water intake structure and supplying cooling water to equipment located throughout the plant. Plant service water is returned to the circulating water tunnel for heat removal by the circulating water system cooling towers.

In addition to the biocide treated circulating water supply utilized by the TSW System, the TSW System is equipped with a biocide treatment system to retard biological growth. Additional chemical treatment capability is provided to minimize silt deposition, scale formation, corrosion, and consequent fouling of heat transfer surfaces.

Required makeup to the TSW System is included as part of the overall circulating water system makeup requirements. The makeup flow can be directed in to the circulating water bay or to one or both of the plant service water pump suctions. This is accomplished by means of a weir box and sluice gate arrangement in the circulating water mixing bay.

Water for plant service water pump bearing lubrication is supplied from the plant service water pump during operation of the pump and is filtered before being injected to lubricate the bearings. The Fire Protection System provides TSW pump bearing lubrication water for initial system startup after both pumps have been secured (or tripped).

Reason for Scope Determination

The TSW System does not perform any safety-related system intended functions that meet the scoping criteria of 10 CFR 54.4(a)(1).

The TSW System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The TSW System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the TSW System meets the scoping criteria of 10 CFR 54.4(a)(2).

The TSW System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 9.2.1.2 of the FSAR describes the Plant Service Water System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M508-1, LR-M548-2

Components Subject to AMR

Table 2.3.3-28 lists the component types that require AMR and their intended functions.

Table 3.3.2-28, Aging Management Review Results – Plant Service Water System, provides the results of the AMR.

Table 2.3.3-28
Plant Service Water System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Annubar	Structural Integrity
Bolting	Structural Integrity
Flow indicator (inline)	Structural Integrity
Orifice	Structural Integrity
Piping	Structural Integrity
Strainer (body)	Structural Integrity
Tubing	Structural Integrity
Valve body	Structural Integrity

2.3.3.30 Potable Cold Water (PWC) System

System Description

The function of the potable water system, consisting of both the PWC System and the Potable Hot Water System (see Section 2.3.3.31), is to supply potable water throughout the plant and to provide supply water to the plant makeup water treatment system; the system can also be used to supply makeup water to the spray ponds. The PWC System is designed to provide cold water to the points of potable water usage such as toilets, showers, sinks, shower and eyewash stations, and electric drinking water coolers located in the various plant buildings, and for site grounds irrigation.

Reason for Scope Determination

The PWC System does not perform any safety-related system intended functions that meet the scoping criteria of 10 CFR 54.4(a)(1).

The PWC System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The PWC System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the PWC System meets the scoping criteria of 10 CFR 54.4(a)(2).

The PWC System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 9.2.4 of the FSAR describes the Potable Cold Water System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-P541-1, LR-M548-1, LR-M548-2, LR-M775

Components Subject to AMR

Table 2.3.3-29 lists the component types that require AMR and their intended functions.

Table 3.3.2-29, Aging Management Review Results – Potable Cold Water System, provides the results of the AMR.

Plumbing fixtures, including the toilet and sinks, that are located in the control room are in a high-traffic area that is manned 24 hours a day. Any leakage would be detected and isolated before adverse consequences (i.e., interaction with safety-related structures and components) would manifest. Therefore, plumbing fixtures are not subject to AMR.

The spray heads and nozzles associated with the shower and eyewash station (PWC-SEW-4) located in the critical switchgear battery room area are normally isolated from the water supply by the spigot valves at point-of-use, and are used only during personnel emergencies. Therefore, the eyewash station spray heads and nozzles are not a spray or leakage concern, and are not subject to AMR.

Table 2.3.3-29
Potable Cold Water System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Piping	Structural Integrity
Pump casing (booster pump)	Structural Integrity
Shock suppressor	Structural Integrity
Strainer (body)	Structural Integrity
Tank (pressurizing tank)	Structural Integrity
Tubing	Structural Integrity
Valve body	Structural Integrity

2.3.3.31 Potable Hot Water (PWH) System

System Description

The function of the potable water system, consisting of both the PWC System (see Section 2.3.3.30) and the PWH System), is to supply potable water throughout the plant and to provide supply water to the plant makeup water treatment system; the system can also be used to supply makeup water to the spray ponds. The PWH System is designed to provide hot water to the points of potable water usage such as sinks and showers located in the various plant buildings. Potable hot water is provided by individual electric hot water heaters.

Reason for Scope Determination

The PWH System does not perform any safety-related system intended functions that meet the scoping criteria of 10 CFR 54.4(a)(1).

The PWH System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The PWH System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the PWH System meets the scoping criteria of 10 CFR 54.4(a)(2).

The PWH System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 9.2.4 of the FSAR describes the Potable Hot Water System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-P541-1

Components Subject to AMR

Table 2.3.3-30 lists the component types that require AMR and their intended functions.

Table 3.3.2-30, Aging Management Review Results – Potable Hot Water System, provides the results of the AMR.

Plumbing fixtures, including sinks, that are located in the control room are in a high-traffic area that is manned 24 hours a day. Any leakage would be detected and isolated before adverse consequences (i.e., interaction with safety-related structures and components) would manifest. Therefore, plumbing fixtures are not subject to AMR.

Table 2.3.3-30
Potable Hot Water System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Piping	Structural Integrity
Shock suppressor	Structural Integrity
Valve body	Structural Integrity

2.3.3.32 Primary Containment (C) System

System Description

The Primary Containment System includes the mechanical components associated with the personnel access lock that are depicted on the license renewal evaluation boundary drawing.

The personnel access lock is a cylindrical shell with two hinged doors, one at each end of the shell. The air lock doors are interlocked to ensure that at least one door is locked when Primary Containment integrity is required. The locking mechanisms are designed so that tight seals are maintained when the doors are subject to either the design internal or external pressure. Quick-acting equalizer valves are provided to equalize the pressure in the air lock when personnel enter or leave the Primary Containment. Connections for an emergency air supply are provided for pressure testing of the air lock.

The personnel access lock penetration, including the air lock doors, is evaluated with the Primary Containment structure in Section 2.4.1. The structural evaluation of the Primary Containment includes all other containment penetrations and access hatches.

Reason for Scope Determination

The Primary Containment System provides primary containment (mechanical components associated with the personnel access lock pressure boundary). This system-intended function is safety-related. Therefore, the Primary Containment System meets the scoping criteria of 10 CFR 54.4(a)(1).

The Primary Containment System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The Primary Containment System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). Therefore, the Primary Containment System does not meet the scoping criteria of 10 CFR 54.4(a)(2).

The Primary Containment System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Sections 3.8.2.1.1.4 and 3.8.2.7.5 of the FSAR describe the mechanical components of the personnel access lock, evaluated for license renewal as the Primary Containment System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M543-2

The personnel access lock is identified as containment penetration X-16. As such, the structural components of the personnel access lock (cylindrical shell, doors, etc.) are not addressed as part of this mechanical system. The personnel access lock structural components are evaluated with the Primary Containment in Section 2.4.1.

Components Subject to AMR

Table 2.3.3-31 lists the component types that require AMR and their intended functions.

Table 3.3.2-31, Aging Management Review Results – Primary Containment System, provides the results of the AMR.

Table 2.3.3-31
Primary Containment System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary
Piping	Pressure Boundary
Tubing	Pressure Boundary
Valve body	Pressure Boundary

2.3.3.33 Process Sampling (PS) System

System Description

The PS System is designed to provide representative samples, under controlled conditions, of plant process streams. Provisions for continuous monitoring of selected systems provide a means of analytical surveillance of system trends and performance during plant operations.

Reason for Scope Determination

The PS System does not perform any safety-related system intended functions that meet the scoping criteria of 10 CFR 54.4(a)(1).

The PS System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The PS System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the PS System meets the scoping criteria of 10 CFR 54.4(a)(2).

The PS System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 9.3.2.1 of the FSAR describes the Process Sampling System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M524-3

Components Subject to AMR

Table 2.3.3-32 lists the component types that require AMR and their intended functions.

Table 3.3.2-32, Aging Management Review Results – Process Sampling System, provides the results of the AMR.

Table 2.3.3-32
Process Sampling System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Structural Integrity
Orifice	Structural Integrity
Piping	Structural Integrity
Strainer (body)	Structural Integrity
Tubing	Structural Integrity
Valve body	Structural Integrity

2.3.3.34 Process Sampling Radioactive (PSR) System

System Description

The PSR System, which for license renewal includes a portion of the Sampling System, is designed to provide representative samples, under controlled conditions, of plant process streams. Provisions for continuous monitoring of selected systems provide a means of analytical surveillance of system trends and performance during plant operations. Laboratory samples are taken to provide comprehensive analytical information on plant operations, a check on continuous monitoring instrumentation, and regular reports on critical plant systems to ensure safe and proper operation.

The sampling system consists of continuous flow in-line analytical instruments, plus numerous grab sample points that are either local or routed to a centralized sampling station. A sample station typically consists of a sink, a sample rack, and a fume hood. Process fluids enter the conditioning rack and, where necessary, pass through one or more heat exchangers to reduce temperatures to 105 °F or less. Pressure is reduced, where necessary, to limit sample pressure to 40 psig or less. After conditioning, the process fluid is routed to the chemical fume hood where grab samples are taken. In the case of continuously monitored process streams, a portion of the fluid is diverted through a constant temperature bath, through conductivity cells and rotameters, and then to a drain line.

Reason for Scope Determination

The PSR System provides Primary Containment isolation and integrity (including valve position indication), and maintains reactor coolant pressure boundary integrity. These system-intended functions are safety-related. Therefore, the PSR System meets the scoping criteria of 10 CFR 54.4(a)(1).

The PSR System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The PSR System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the PSR System meets the scoping criteria of 10 CFR 54.4(a)(2).

The PSR System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Section 9.3.2.1 of the FSAR describes the Process Sampling System, a portion of which is evaluated for license renewal as the Process Sampling Radioactive System and by inclusion, the Sampling System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M517, LR-M607-1, LR-M607-2, LR-M607-3, LR-M607-4, LR-M896

The ASME Code Class 1 portions of the PSR System, from the RPV to and including the outboard containment isolation valves (PSR-V-X77A/2, PSR-V-X77A/4) are evaluated as part of the reactor coolant pressure boundary in Section 2.3.1.3. Also included in the reactor coolant pressure boundary evaluation are the ASME Code Class 1 portions of the process instrumentation. The process instrumentation components (associated with PSR) that are not included in the ASME Code Class 1 boundary are included in the PSR evaluation boundary.

The portions of the Sampling System within the scope of license renewal (on LR-M607-1, the NSAS portions only) are included within the evaluation boundaries of the PSR System.

Components Subject to AMR

Table 2.3.3-33 lists the component types that require AMR and their intended functions.

Table 3.3.2-33, Aging Management Review Results – Process Sampling Radioactive System, provides the results of the AMR.

Sample racks PSR-SR-6 and PSR-SR-7 are located in room R516 in the Reactor Building. The plant analysis for Moderate Energy Systems Pipe Break evaluated Plant Service Water (TSW) and SW lines spraying on safety-related equipment in this room. Therefore, the failure of NSR components within the sample racks is bounded by the TSW and SW lines in the analysis and the racks are not subject to AMR.

Sample rack PSR-SR-49 is located in room R510 in the Reactor Building. The plant analysis for Moderate Energy Systems Pipe Break evaluated TSW, RHR, and Reactor Closed Cooling Water (RCC) lines spraying on equipment in this room. Therefore, the failure of NSR components within the sample rack is bounded by the TSW, RHR, and RCC lines in the analysis and the rack is not subject to AMR.

Sample rack PSR-SR-47 is located in a shielded pipe chase. As such, the components within the sample racks (such as PSR-HX-E604 and E605), which are all NSR, do not meet the NSAS criteria and are not subject to AMR.

Sample racks PSR-SR-6 and PSR-SR-47 function as anchors for safety-related to NSR interfaces and are evaluated as structural commodities in Section 2.4.13.

The external leakage boundary (i.e., shell) of PSR heat exchangers PSR-CC-1 and S-HX-2C will contain fluid in the event of a failure of an internal part (i.e., tubes). Therefore, failure of an internal part does not create a potential for spatial interaction that could prevent the performance of the intended functions of safety-related SSCs and the internal parts of the heat exchangers are not subject to AMR.

Table 2.3.3-33
Process Sampling Radioactive System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Filter body	Structural Integrity
Heat exchanger (shell)	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Pump casing	Structural Integrity
Tubing	Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.35 Pump House HVAC Systems

System Description

The standby service water pump house HVAC system and the makeup water pump house HVAC system form the Pump House HVAC Systems, which is comprised of Pump House Exhaust Air (PEA), Pump House Mixed Air (PMA), Pump House Outside Air (POA), and Pump House Return Air (PRA) subsystems.

The standby service water pump house HVAC system is designed to remove the heat generated by operation of the SW pumps and the HPCS service water pump and to limit the temperature in the two pump houses.

SW pump A and the HPCS service water pump share one pump house and SW pump B is in a second pump house. Each pump house HVAC system consists of a fan coil unit composed of a sheet metal cabinet containing a direct-drive centrifugal fan and a water cooling coil, and a separate centrifugal supply fan with inlet mixing dampers. Each fan coil unit is interlocked electrically with the associated SW pump it serves in such a manner that the unit fan starts and recirculates room air over the water cooling coil when the pump starts. Water is supplied to the unit coil from the main supply header of the SW pump. The fan coil units are normally in standby and operate only when the pump is started. The supply ventilation fans in both pump rooms operate automatically when required to maintain temperature within operating limits.

The makeup water pump house HVAC system maintains suitable conditions for operation of the makeup water pumps, which may be operated to refill the SW spray ponds following the hypothesized dewatering of the ponds due to a tornado. Since the ventilation system must be operated to ensure an acceptable environment for the makeup water pump motors, the system is designed with redundant equipment to ensure that a single component failure will not interfere with system function. In the event that a tornado causes the loss of offsite power, the system is powered from the emergency diesel generator buses.

The makeup water pump house HVAC system consists of two full-capacity air-handling units and two battery hood exhaust fans that service the electric equipment area, and two full-capacity fan coil units and two electric space heaters that service the pump area.

The two air-handling units serving the electric equipment area consist of an insulated sheet metal cabinet housing a replaceable roughing filter, a two-stage electric blast coil heater, a water cooling coil, and a centrifugal fan. One of the two air-handling units operates at all times to maintain design temperatures in the electrical equipment area. The second unit is in standby and starts in the event that the operating unit fails.

The air-handling units draw air from the outside atmosphere through intake louvers. The air is discharged, via ductwork, into the electrical equipment area from which it flows into the pump room. It is then released either to the outside atmosphere, via relief dampers, or is partially recirculated back through the unit.

The fan coil units servicing the pump area consist of a centrifugal fan, a water cooling coil, and a roughing filter in sheet metal housing. The units recirculate air in the pump room only and are interlocked electrically with the makeup water pumps to start when the pumps start. Each unit has sufficient capacity to maintain design conditions with two of the makeup water pumps operating.

Reason for Scope Determination

The Pump House HVAC Systems provide Service Water Pump House cooling (PRA). This system-intended function is safety-related. Therefore, the Pump House HVAC Systems meet the scoping criteria of 10 CFR 54.4(a)(1).

The Pump House HVAC Systems contain NSR components that perform the following 10 CFR 54.4(a)(1) functions:

- Support the Tower Makeup Water System, which in turn supports the once-through cooling mode of the SW System to mitigate the consequences of a design basis tornado (PEA and PMA).
- Support the once-through cooling mode of the SW System to mitigate the consequences of a design basis tornado (POA and PRA).

These system-intended functions are NSAS functions.

The Pump House HVAC Systems (PRA only) also contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the Pump House HVAC Systems meet the scoping criteria of 10 CFR 54.4(a)(2).

The Pump House HVAC Systems are relied upon to demonstrate compliance with, and meet the 10 CFR 54.4(a)(3) scoping criteria for the following regulated events (the associated system is indicated in brackets):

- Fire Protection (10 CFR 50.48) [PRA]
- Station Blackout (10 CFR 50.63) [POA]

FSAR References

Sections 9.4.10 and 9.4.12 of the FSAR describe the HVAC systems for the Standby Service Water Pump House and the Makeup Water Pump House, respectively. These HVAC systems are evaluated for license renewal as the Pump House HVAC Systems.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M551

Components Subject to AMR

Table 2.3.3-34 lists the component types that require AMR and their intended functions.

Table 3.3.2-34, Aging Management Review Results – Pump House HVAC Systems, provides the results of the AMR.

Component filter media are short-lived components (consumables) and are not subject to AMR. The associated filter housings have a pressure boundary function and are subject to AMR.

Electric blast coil heaters that are located within the evaluation boundaries of the HVAC systems are either installed in ducts or in air-handling units. In both cases, the heaters are electrical components that are fully enclosed within the ducts or air-handling units and therefore do not support a pressure boundary function. Since the heaters do not perform a mechanical intended function they are not subject to AMR.

Table 2.3.3-34
Pump House HVAC Systems
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Air-handling unit housing	Pressure Boundary
Bird screen	Filtration
Bolting	Pressure Boundary Structural Integrity
Damper housing	Pressure Boundary
Drain pan	Structural Integrity
Duct	Pressure Boundary
Fan housing	Pressure Boundary
Fan cooler unit housing	Pressure Boundary
Filter housing	Pressure Boundary
Flexible connection	Pressure Boundary
Heat exchanger (cooling coil headers)	Pressure Boundary
Heat exchanger (cooling coil fins)	Heat Transfer
Heat exchanger (cooling coil tubes)	Heat Transfer Pressure Boundary
Mechanical sealants	Pressure Boundary
Piping	Structural Integrity
Tubing	Pressure Boundary

2.3.3.36 Radwaste Building Chilled Water (WCH) System

System Description

The WCH System is designed to provide a reliable source of chilled water to the main control room air handling units (WMA-AH-51A/B), the cable spreading room air handling units (WMA-AH-52A/B), the switchgear area air handling units (WMA-AH-53A/B), and the air handling units serving the conditioned areas of the Radwaste Building.

The WCH System is a closed loop system incorporating two 100%-capacity pumps and two 100 percent-capacity centrifugal water chillers. The chillers are arranged to operate independently with bypass and shutoff valves provided for ease of maintenance. During normal operation, either chiller (or both) operates to maintain the chilled water supplied to the air handling units between 44 °F and 55 °F. The two chilled water pumps are arranged in parallel with one normally operating and one in standby. The liquid chillers each consist of a hermetic centrifugal compressor, an evaporator, a water-cooled condenser, and a purge system. Condenser cooling water is supplied to the chillers from the Plant Service Water System.

Reason for Scope Determination

The WCH System does not perform any safety-related system intended functions that meet the scoping criteria of 10 CFR 54.4(a)(1).

The WCH System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The WCH System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the WCH System meets the scoping criteria of 10 CFR 54.4(a)(2).

The WCH System is not contain relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 9.4.4 of the FSAR describes the Radwaste Building Chilled Water System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M550-2

The only portions of the WCH System that are within scope are the piping and components between the isolation valves WCH-V-64 and 65 and air handling units for the control room, WMA-AH-51A (upper and lower cooling coils) and WMA-AH-51B (upper and lower cooling coils), and the cable spreading room, WMA-AH-52A and WMA-AH-52B. Portions of the WCH System outside the boundaries of the Control Structure are not within the scope of license renewal. This includes the chiller units (WCH-CR-51A and 51B), the chilled water pumps (WCH-P-51A and 51B), the air separator (WCH-DU-51), the expansion tank (WCH-TK-51), the chemical feed tank (WCH-TK-52), and associated piping.

Components Subject to AMR

Table 2.3.3-35 lists the component types that require AMR and their intended functions.

Table 3.3.2-35, Aging Management Review Results – Radwaste Building Chilled Water System, provides the results of the AMR.

Table 2.3.3-35
Radwaste Building Chilled Water System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Structural Integrity
Piping	Structural Integrity
Strainer body	Structural Integrity
Tubing	Structural Integrity
Valve body	Structural Integrity

2.3.3.37 Radwaste Building HVAC Systems

System Description

Three separate HVAC systems make up the Radwaste Building HVAC Systems, one each serving the main control room, the cable spreading room, and the critical switchgear area. The three systems are each located, one above the other, on different elevations in the Radwaste Building. Redundant trains are provided for the main control room and the cable spreading room. The Radwaste Building HVAC Systems is comprised of Radwaste Building Exhaust Air (WEA), Radwaste Building Mixed Air (WMA), Radwaste Building Outside Air (WOA), and Radwaste Building Return Air (WRA) subsystems.

During an emergency condition, the Standby Service Water (SW) System is used as the cooling medium for the cable spreading room and critical switchgear area systems. Either the Control Room Chilled Water (CCH) System or the SW System is used as the cooling medium for the main control room HVAC system during emergency conditions. The SW System provides sufficient cooling for equipment operability. The CCH System provides additional cooling capacity for personnel comfort.

Main Control Room - Each of the main control room's 100%-capacity HVAC systems are composed of a primary air-handling system and an emergency filter system. The two HVAC systems share a common outside air intake system and a common duct distribution system within the main control room. A single exhaust system, composed of a fan, shutoff damper, and ductwork, discharges air from the main control room toilet and kitchen. The exhaust fan operates continuously during normal operations.

Each primary air-handling system consists of a centrifugal supply fan that blows through an air-handling unit consisting of an air filter, two water cooling coils in series (one for radwaste chilled water, and one for control room chilled water or SW), and an electric blast coil heater and associated ductwork and dampers. Separate return air ductwork containing a sound absorber unit is provided from the main control room to each of the primary air-handling systems.

During normal operation one air-handling system operates, distributing air to the main control room. The temperature is controlled by electronic controllers located in the main control room, which modulate the chilled water flow to the cooling coil.

The two emergency filter systems are normally in standby and operate in the event of an emergency. Each of the emergency filter systems consists of an emergency filter unit, an electric heater, bypass and recirculation control dampers, and associated ductwork. Each emergency filter unit consists of a medium efficiency pre-filter, high efficiency particulate air (HEPA) filter, activated charcoal filters, and direct drive centrifugal fan, all enclosed in an all-welded sheet metal housing. A deluge water spray system is provided to soak the charcoal filters in the event of high temperatures in the charcoal beds. Check valves are provided on all drain connections from the filter unit, and the drain header is provided with a deep water seal trap to prevent in-leakage of air during unit operation. The electric heater located in the fresh air duct to each emergency filter limits the relative humidity of the air entering the filter to 70%.

The three fresh air intakes (one normal and two remote) for the main control room are fitted with two butterfly isolation valves in series. The normal control room fresh air local intake valves are automatic isolation valves. The normal fresh air intake valves have electro-hydraulic operators, which are powered from the Class 1E buses. All fresh air intakes are connected via ductwork to a common intake header from which both main control room air-handling systems and both emergency filter systems draw fresh air.

Cable Spreading Room - The cable spreading room HVAC system consists of two 100%-capacity air-handling units, each with its own duct distribution system, a common distribution system inside the cable spreading room, and one purge exhaust fan. The air-handling units are similar to those servicing the main control room (i.e., filter, SW coil, chilled water coil, electric heater, and centrifugal fan in a sheet metal housing). Normally one air-handling unit operates continuously on a 100% recirculation mode of operation maintaining the cable spreading room and remote shutdown room at approximately 80 °F.

The cable spreading room purge exhaust fan does not normally operate. In the event of a fire developing in the cable spreading room, the purge fan can be manually operated to remove any smoke from the cable spreading room prior to personnel access. If the radwaste chilled water supply to the cable spreading room air-handling units is lost, SW is supplied to the units for emergency cooling. Under this mode of operation, the cable spreading room and remote shutdown room temperature is limited below equipment operability limits.

Critical Switchgear Area - The switchgear and batteries associated with the redundant emergency electric power systems are located in separate equipment rooms below the cable spreading room. A separate heating and ventilation system is provided for each set of equipment rooms. Each of the two heating and ventilating systems consists of an air-handling unit, battery room exhaust fans, and associated ductwork and controls. The air-handling unit consists of a roughing filter, two cooling coils in series, an electric blast coil heater, and a centrifugal fan in a sheet metal housing. The two air-handling units have different capacities due to heat load differences between the two sets of rooms. Electric heaters are provided in the ducts supplying air to the battery rooms to maintain temperature in those rooms above 60 °F.

Both heating and ventilating systems normally operate continuously during all modes of operation. They are both partial recirculation systems with fresh air provided as makeup for the air exhausted from the battery rooms. The battery rooms are continuously exhausted (no recirculation) to prevent the possible buildup of combustible gases generated by the batteries.

Reason for Scope Determination

The Radwaste Building HVAC Systems provide:

- ESF exhaust systems in the main control room, battery rooms, critical switchgear rooms, and cable spreading room [WEA]
- Cooling and emergency filtration to the control room [WMA]
- Cooling and filtration to the critical switchgear rooms [WMA]
- Cooling and filtration to the cable spreading room [WMA]
- Isolation valves to maintain the control room remote air source integrity [WMA]
- Outside air intakes to the Radwaste Building ESF HVAC system [WOA]

These system-intended functions are safety-related. Therefore, the Radwaste Building HVAC Systems meet the scoping criteria of 10 CFR 54.4(a)(1).

The Radwaste Building HVAC Systems do not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The Radwaste Building HVAC Systems do, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the Radwaste Building HVAC Systems meet the scoping criteria of 10 CFR 54.4(a)(2). [WEA, WMA, WOA, WRA]

The Radwaste Building HVAC Systems are relied upon to demonstrate compliance with, and meet the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) regulated event. [WEA, WMA, WOA]

FSAR References

Sections 9.4.1 and 9.4.3 of the FSAR describe the HVAC systems for the Radwaste Building. These HVAC systems are evaluated for license renewal as the Radwaste Building HVAC Systems.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M548-1, LR-M548-2, LR-M549-1

Valves in the plant service water supply and return lines to room air conditioning units WRA-AC-51 and WRA-AC-52 that are assigned by EPN to the Plant Service Water (TSW) System are included in the Radwaste Building HVAC systems evaluation boundary for completeness.

Drain piping associated with the remote intake structures (No. 1 and No. 2) is not shown on license renewal drawing LR-M548-1, it is only depicted on an associated structural drawing. The drain piping is included with the Radwaste Building HVAC systems evaluation boundary.

Components Subject to AMR

Table 2.3.3-36 lists the component types that require AMR and their intended functions.

Table 3.3.2-36, Aging Management Review Results – Radwaste Building HVAC Systems, provides the results of the AMR.

Component filter media are short-lived components (consumables) and not subject to AMR. The associated filter housings have a pressure boundary function and are subject to AMR.

Electric blast coil heaters that are located within the evaluation boundaries of the HVAC systems are either installed in ducts or in air-handling units. In both cases, the heaters are electrical components that are fully enclosed within the ducts or air-handling units and therefore do not support a pressure boundary function. Since the heaters do not perform a mechanical intended function they are not subject to AMR.

Instrument tubing that is in scope for NSAS because it is attached to safety-related components duct contains no liquid and does not provide structural support for those attached components. Therefore, this tubing is not required to maintain its structural integrity, since its failure cannot adversely affect connected or nearby safety-related components, and is not subject to AMR. All other in-scope instrument tubing is subject to AMR.

Table 2.3.3-36
Radwaste Building HVAC Systems
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Air-handling unit housing	Pressure Boundary
Bolting	Pressure Boundary Structural Integrity
Condenser (shell)	Structural Integrity
Damper housing	Pressure Boundary
Drain pan	Structural Integrity
Duct	Pressure Boundary
Fan housing	Pressure Boundary
Filter housing	Pressure Boundary
Flexible connection	Pressure Boundary
Heat exchanger (cooling coil headers)	Pressure Boundary
Heat exchanger (cooling coil fins)	Heat Transfer
Heat exchanger (cooling coil tubes)	Heat Transfer Pressure Boundary
Mechanical sealants	Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Sound absorber casing	Pressure Boundary
Strainer body	Structural Integrity
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.38 Reactor Building HVAC Systems

System Description

The Reactor Building HVAC systems are comprised of Reactor Building Exhaust Air (REA), Reactor Building Outside Air (ROA), and Reactor Building Return Air (RRA) subsystems.

The Reactor Building HVAC systems operate as “push-pull” heating and ventilation systems, providing once-through air flow with no recirculation, and consist of supply air, exhaust air, and emergency cooling systems. Sump vent exhaust filter and miscellaneous ventilation are in scope for NSAS only.

Supply Air - The supply air consists of a heating and ventilation unit, air distribution ductwork, two isolation butterfly valves on the fresh air intake, and associated controls. During normal plant operation and shutdown, the supply air system isolation valves are open and the ventilation system operates continuously, distributing tempered 100% outdoor air throughout the building. One supply fan is normally operating with the second fan in standby. The standby fan starts automatically in the event the operating fan fails.

Exhaust Air - The exhaust system draws air from all areas with potential radiation contamination and discharges it to the elevated release point. There are two 100%-capacity fans in the system. One fan normally operates, with the second fan in standby. Approximately one-half of the Reactor Building exhaust air is drawn from the refueling level of the Reactor Building. Intake ducts to the exhaust system are embedded around the periphery of the spent fuel pool, dryer and separator pool, and reactor well to remove any potentially radioactive vapors generated in the pools.

Radiation monitors are located just outside of the exhaust air plenum on the intake side of the two Reactor Building exhaust fans. In the event that a preset high-level limit of radioactivity is exceeded, the radiation monitors will annunciate an alarm in the main control room and transmit an isolation signal to the affected emergency safeguards systems. In the event of an emergency signal, the Reactor Building exhaust fans stop and the isolation valves close.

Emergency Cooling - All equipment located within the Reactor Building that requires a controlled environment to operate and which must operate in the event of a LOCA, is enclosed in individual equipment rooms. These rooms are normally heated and ventilated by the supply and exhaust systems described above. Under emergency conditions, these rooms are automatically cooled by recirculation of room air through their respective Reactor Building emergency cooling system. Ambient temperatures of the rooms are maintained below equipment operability limits during all emergency modes of operation.

The critical motor control center, analyzer, and fuel pool cooling (FPC) pump room emergency cooling fans auto start and the rooms are isolated from the Reactor Building HVAC system on an emergency signal. Although the FPC pump room is isolated from the Reactor Building HVAC system, the room temperature can be maintained below equipment operability limits with the Reactor Building HVAC dampers open. The ECCS and RCIC pump rooms emergency cooling fans auto start when their respective pump starts.

Each of the rooms housing critical equipment is provided with an individual air-handling unit (two units in the FPC pump room), which is fully enclosed within the room. Each air-handling unit is comprised of a fan and a water cooling coil in a sheet metal housing. Water is supplied to the cooling coils by the Standby Service Water System. During normal operation, these air-handling units are in standby. All units recirculate the air within the room they serve, removing the heat generated in the room via the cooling coil, to maintain temperatures below design limits.

<u>Reason for Scope Determination</u>

The Reactor Building HVAC systems provide:

- Secondary containment isolation and integrity [REA, ROA]
- Cooling to critical switchgear, ECCS pump rooms, and other vital rooms in the Reactor Building during emergency conditions [RRA]

These system-intended functions are safety-related. Therefore, the Reactor Building HVAC systems meet the scoping criteria of 10 CFR 54.4(a)(1).

The Reactor Building HVAC systems do not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The Reactor Building HVAC systems do, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the Reactor Building HVAC systems meet the scoping criteria of 10 CFR 54.4(a)(2). [REA, ROA, RRA]

The Reactor Building HVAC systems are relied upon to demonstrate compliance with, and meet the 10 CFR 54.4(a)(3) scoping criteria for, the following regulated events:

- Fire Protection (10 CFR 50.48) [REA, ROA, RRA]
- Environmental Qualification (10 CFR 50.49) [REA, ROA, RRA]
- Station Blackout (10 CFR 50.63) [RRA]

FSAR References

Sections 9.4.2 and 9.4.9 of the FSAR describe the HVAC systems for the Reactor Building. These HVAC systems are evaluated for license renewal as the Reactor Building HVAC Systems.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M545-1, LR-M545-2, LR-M545-3, LR-M544

Components Subject to AMR

Table 2.3.3-37 lists the component types that require AMR and their intended functions.

Table 3.3.2-37, Aging Management Review Results – Reactor Building HVAC Systems, provides the results of the AMR.

The outdoor air intake louver at the supply end of Reactor Building HVAC systems does not perform a component intended function for license renewal, and therefore is not subject to AMR. The associated housings (damper housings) have a pressure boundary function and are subject to AMR.

Failure of the solenoid-operated three-way valves or associated air lines that provide control air to an actuator for an in-scope damper or valve places the damper or valve in a safe position. Therefore, pressure-boundary integrity is not a required component intended function of these solenoid valves, air supply lines, or actuators for the system to perform its intended function. Since these components have no other component intended function, they are not subject to AMR.

Table 2.3.3-37
Reactor Building HVAC Systems
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Air-handling unit housing	Structural Integrity
Air washer housing	Structural Integrity
Bolting	Pressure Boundary Structural Integrity
Damper housing	Pressure Boundary
Drain pan	Structural Integrity
Duct	Pressure Boundary
Fan cooler unit housing	Pressure Boundary Structural Integrity
Flexible connection	Pressure Boundary Structural Integrity
Heat exchanger (cooling coil headers)	Pressure Boundary
Heat exchanger (cooling coil fins)	Heat Transfer
Heat exchanger (cooling coil tubes)	Heat Transfer Pressure Boundary
Heat exchanger (heating coil housings and headers)	Structural Integrity
Mechanical sealants	Pressure Boundary
Piping	Structural Integrity
Pump casing	Structural Integrity
Tubing	Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.39 Reactor Closed Cooling Water (RCC) System

System Description

The RCC System is a closed loop system that provides parallel-flow cooling to auxiliary equipment in the Primary Containment, Reactor Building, and Radwaste Building. The system consists of pumps, heat exchangers, tanks, piping, valves, and instrumentation. Each of the three pumps and three heat exchangers are 50% capacity based on maximum normal cooling requirements. Heat is removed from the RCC System by the Plant Service Water System. Plant service water is passed through the tube side of the RCC heat exchangers and the closed-loop water is passed through the shell side. A 550-gallon surge tank accommodates volume changes from thermal expansion and contraction. Makeup water to the system is supplied to the surge tank by the Demineralized Water System.

A chemical addition tank and metering pump were included in the original design for the addition of corrosion inhibiting chemicals, but are not used.

Reason for Scope Determination

The RCC System provides Primary Containment isolation and integrity, secondary containment isolation and integrity, fuel pool cooling heat exchangers and piping for backup cooling from the Standby Service Water System, and a boundary valve (RCC-V-129) based on an NRC commitment. These system-intended functions are safety-related. Therefore, the RCC System meets the scoping criteria of 10 CFR 54.4(a)(1).

The RCC System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The RCC System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the RCC System meets the scoping criteria of 10 CFR 54.4(a)(2).

The RCC System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Section 9.2.2 of the FSAR describes the Reactor Building Closed Cooling Water System, evaluated for license renewal as the Reactor Closed Cooling Water System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M523-2, LR-M525-1, LR-M525-2, LR-M607-1, LR-M607-2

The isolation valve (CF-V-101) associated with the chemical addition metering pump (RCC-P-2) is assigned by EPN to the Chemical Feed (CF) System but included in the evaluation boundaries of the RCC System for license renewal.

Components Subject to AMR

Table 2.3.3-38 lists the component types that require AMR and their intended functions.

Table 3.3.2-38, Aging Management Review Results – Reactor Closed Cooling Water System, provides the results of the AMR.

A chemical addition tank (RCC-TK-2) and metering pump (RCC-P-2) were included in the original design for the addition of corrosion inhibiting chemicals. This chemical addition equipment is isolated and not used, does not contain water, and is not directly connected to any safety-related SSCs. Therefore, failure of the tank or pump will not create a potential for spatial interaction that could prevent the performance of the intended functions of safety-related SSCs. These components do not perform an intended function for license renewal and are not subject to AMR.

Potential leakage of the internal components of the RCC heat exchanger (i.e., tubes, tubesheets) will be contained within the external leakage boundary (i.e., shell, channel covers). Failure of the internal components does not create a potential for spatial interaction that could prevent the performance of the intended functions of safety-related SSCs. Therefore, the internal components of the RCC heat exchangers are not subject to AMR.

Flexible connections RCC-FLX-1 and RCC-FLX-2 are periodically replaced in accordance with preventive maintenance activities. These components are therefore short-lived and not subject to AMR.

Table 2.3.3-38
Reactor Closed Cooling Water System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Annubar	Pressure Boundary Structural Integrity
Bolting	Pressure Boundary Structural Integrity
Demineralizer	Structural Integrity
Filter body	Structural Integrity
Heat exchanger (channel and shell)	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Pump casing	Structural Integrity
Sight glass	Structural Integrity
Tank (RCC-TK-1)	Structural Integrity
Trap body	Structural Integrity
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.40 Reactor Protection System (RPS)

System Description

The RPS is designed to cause rapid insertion of control rods (SCRAM) to shut down the reactor when specific variables exceed predetermined limits. One of the inputs to the RPS is turbine governor valve position. Turbine governor valve fast closure inputs to the RPS originate from oil line pressure switches on each of four fast acting governor valve hydraulic mechanisms. Each pressure switch provides an input signal to one of the four RPS sensor trip channels. If hydraulic oil line pressure is lost, a turbine governor valve fast closure SCRAM is initiated.

As a direct cycle boiling water reactor, all steam generated by the reactor is normally accepted by the turbine. The operation of the reactor requires pressure regulation to maintain a constant turbine inlet pressure with load following ability accomplished by variation of reactor power.

The turbine pressure regulator normally controls the turbine governor valves to maintain constant turbine inlet pressure at a particular value. During normal plant operation, steam pressure is controlled by the main turbine governor valves, positioned in response to the pressure demand signal. Control for the turbine governor valves is designed so that the valves will close upon loss of control system electric power or loss of hydraulic system pressure.

RPS instrument lines associated with the Digital Electro-Hydraulic Control (DEH) System, some of which are assigned to the Instrument Rack System, are noted as safety-related on the RPS flow diagram. The attached DEH lines are NSR but provide structural integrity to support the safety-related RPS instruments. However, a loss of pressure boundary function for the RPS components initiates an emergency reactor shutdown, which is the license renewal intended function of the RPS System. Therefore, the structural integrity function of the DEH components is not required, and the DEH System is not in scope. Components (i.e., valves) assigned by EPN to the Instrument Rack System are included within the evaluation boundaries of the RPS.

Reason for Scope Determination

The RPS provides emergency reactor shutdown (scram). This system-intended function is safety-related. Therefore, the RPS meets the scoping criteria of 10 CFR 54.4(a)(1).

The RPS does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The RPS does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). Therefore, the RPS does not meet the scoping criteria of 10 CFR 54.4(a)(2).

The RPS is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Sections 7.2 and 7.7.1.5 of the FSAR describe the Reactor Protection System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M959

Components (i.e., valves) assigned by EPN to the Instrument Rack (IR) System on license renewal drawing LR-M959 are included within the evaluation boundaries of the RPS for completeness.

Components Subject to AMR

A loss of hydraulic oil line pressure results in a turbine trip; thus a failure of any of the in-scope safety-related mechanical components places the plant in a safe condition (i.e., the system-intended function is accomplished). Therefore, pressure-boundary integrity is not a required component intended function for the system to perform its intended function. The in-scope RPS components have no other component intended function, and therefore are not subject to AMR.

The in-scope safety-related components in the RPS are attached to NSR components. However, since the safety-related components are mounted on instrument racks (81 through 84) that are Seismic Category I and the RPS is designed to fail safe as discussed above, spatial interaction as a result of a failure of NSR components can not prevent the RPS from performing its intended function.

Therefore, there are no mechanical components in the RPS that are subject to AMR. The RPS is also evaluated as an electrical system in Section 2.5.

2.3.3.41 Reactor Water Cleanup (RWCU) System

System Description

The RWCU System continuously purifies reactor water during all modes of reactor operation. The system takes suction from the inlet of each reactor main recirculation pump and from the RPV bottom head. Processed water is returned to the RPV, to the main condenser, or to radwaste.

During normal reactor operation the RWCU pump (RWCU-P-1A or RWCU-P-1B) takes suction from the reactor recirculation pumps and the RPV bottom head drain line. The RWCU pump moves the reactor coolant through the tube side of the regenerative heat exchangers (RWCU-HX-1A, 1B, and 1C) and then through the tube side of the non-regenerative heat exchangers (RWCU-HX-2A and 2B). Within the regenerative heat exchangers, fluid coming from the reactor gives up a portion of its heat to the cooler filter demineralizer effluent on the shell side flowing back to the RPV. Water from the Reactor Closed Cooling Water System is circulated through the shell side of the non-regenerative heat exchanger thereby cooling the reactor water flowing through the tube side of the unit to be compatible with the demineralizer resin.

After passing through the heat exchangers, the reactor coolant can be valved through one or both filter demineralizers (RWCU-DM-1A and 1B). After the flow has been directed through the filter demineralizer subsystem and reheated in the regenerative heat exchangers, it is returned to the reactor vessel just upstream of the check valves on the feedwater return legs.

Reason for Scope Determination

The RWCU System provides Primary Containment isolation and integrity (isolate RWCU piping through containment), provides RWCU flow mismatch isolation, and maintains reactor coolant pressure boundary integrity. These system-intended functions are safety-related. Therefore, the RWCU System meets the scoping criteria of 10 CFR 54.4(a)(1).

The RWCU System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The RWCU System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). Therefore, the RWCU System meets the scoping criteria of 10 CFR 54.4(a)(2).

The RWCU System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Section 5.4.8 of the FSAR describes the Reactor Water Cleanup System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M523-1, LR-M523-2

Portions of the RWCU System are in the Radwaste Building and outside of the control room tower boundary; as such these components are outside the scope of license renewal. This includes the filter demineralizer subsystem and its associated demineralizers, piping, pumps, and tanks.

Components Subject to AMR

Table 2.3.3-39 lists the component types that require AMR and their intended functions.

Table 3.3.2-39, Aging Management Review Results – Reactor Water Cleanup System, provides the results of the AMR.

The external subcomponents (shell and channel covers) of the RWCU heat exchangers will contain fluid leakage in the event of a failure of an internal subcomponent (tubes and tubesheet). Failure of an internal subcomponent will therefore not create the potential for spatial interaction that could prevent a safety-related SSC from performing its intended function. Therefore, the RWCU heat exchanger tubes and tubesheets are not subject to AMR.

Class 1 components of the RWCU System that are part of the reactor coolant pressure boundary are evaluated in Section 2.3.1.3.

Table 2.3.3-39
Reactor Water Cleanup System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Heat exchanger (channel, diaphragm, and shell)	Structural Integrity
Orifice	Pressure Boundary Structural Integrity Throttling
Piping	Pressure Boundary Structural Integrity
Pump casing	Structural Integrity
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.42 Service Air (SA) System

System Description

The SA System provides compressed air for general services (such as demineralizer resin mixing and filter and demineralizer backwashing) and hose connections for maintenance and the breathing air system. The SA System, with its own compressors and dryers, is cross-connected with, but designed to be isolated from the Control Air System (CAS) supply piping to conserve air for CAS use. The SA System is not required for the initiation of any engineered safeguard system or for safe shutdown of the reactor. Therefore, the SA System function is NSR.

Reason for Scope Determination

The SA System provides Primary Containment isolation and integrity. These system-intended functions are safety-related. Therefore, the SA System meets the scoping criteria of 10 CFR 54.4(a)(1).

The SA System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The SA System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the SA System meets the scoping criteria of 10 CFR 54.4(a)(2).

The SA System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 9.3.1 of the FSAR describes the Service Air System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M510-3

Components Subject to AMR

Table 2.3.3-40 lists the component types that require AMR and their intended functions.

Table 3.3.2-40, Aging Management Review Results – Service Air System, provides the results of the AMR.

The piping and valves associated with containment penetration X93 are part of the SA System. The containment penetration itself is evaluated as a structural component of the Primary Containment in Section 2.4.1.

Table 2.3.3-40
Service Air System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.43 Standby Liquid Control (SLC) System

System Description

The SLC System has the capacity for controlling the reactivity difference between the steady-state operating condition of the reactor with voids and the cold shutdown condition, including shutdown margin, to ensure complete shutdown from the most reactive condition at any time in core life. The SLC System also has the capability to inject sodium pentaborate solution into the reactor vessel in response to a LOCA to control the pH in the suppression pool. Re-evolution of iodine from the suppression pool water can be minimized by maintaining the suppression pool pH level greater than 7.0.

The SLC System is manually initiated through two key lock switches from the main control room to pump a boron neutron absorber solution into the reactor if the operator determines that the reactor cannot be shut down with the control rods or if suppression pool pH control is required to mitigate the dose consequences of a LOCA.

The boron solution tank, the test water tank, the two positive displacement pumps, the two explosive valves, the two motor-operated pump suction valves, and associated local valves and controls are located in the Reactor Building.

The sodium pentaborate solution is prepared in the SLC tank (SLC-TK-1). An air sparger is provided in the tank for mixing. To prevent system plugging, the tank outlet is raised above the bottom of the tank. The saturation temperature of the solution is 67^{o}F at the maximum concentration of 15.0%. An automatic electrical resistance heater system provides heat to maintain the solution temperature greater than saturation conditions for sodium pentaborate to prevent precipitation during storage. The pump suction piping from the storage tank to the pump suction valves is also electrically heat traced.

The positive displacement pumps are sized to inject the solution into the reactor in approximately one hour with both pumps operating. The system design pressure between the pump discharge and the explosive valves is 1400 psig, at which pressure the two relief valves are set. To prevent bypass flow from one pump to the other (in case of relief valve failure), a check valve is installed downstream of each relief valve line in the pump discharge piping.

The two explosive-actuated injection valves provide assurance of opening when needed and ensure that boron will not leak into the reactor even when the pumps are being tested. Each explosive valve is closed by a plug in the inlet chamber. The shearing plug is actuated by an explosive charge with dual ignition primers inserted in the side of the valve. The two ignition circuits of each explosive valve are monitored for continuity. If either circuit opens, a bypass and inoperable status indication display occurs in the main control room.

The boron solution is piped into the reactor vessel and discharged into the core via the HPCS System header so that it mixes with the cooling water.

Equipment drains and tank overflow are not piped to the radwaste system, but to separate containers (such as 55-gallon drums) for removal and disposal to prevent any trace of boron solution from reaching the reactor.

Reason for Scope Determination

The SLC System provides Primary Containment isolation and integrity (including valve position indication), and maintains the reactor coolant pressure boundary integrity. These system-intended functions are safety-related. Therefore, the SLC System meets the scoping criteria of 10 CFR 54.4(a)(1).

The SLC System contains NSR components that perform a 10 CFR 54.4(a)(1) function to inject boron into the RPV for suppression pool pH control to mitigate the dose consequences of a LOCA.

The SLC System also contains NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the SLC System meets the scoping criteria of 10 CFR 54.4(a)(2).

The SLC System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) and Anticipated Transients Without Scram (10 CFR 50.62) regulated events.

FSAR References

Section 9.3.5 of the FSAR describes the Standby Liquid Control System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M522

Components Subject to AMR

Table 2.3.3-41 lists the component types that require AMR and their intended functions.

Table 3.3.2-41, Aging Management Review Results – Standby Liquid Control System, provides the results of the AMR.

The ASME Code Class 1 portions of the SLC System, from the reactor vessel to and including the outboard containment isolation valves are evaluated as part of the reactor coolant pressure boundary in Section 2.3.1.3. The HPCS System sparger is evaluated as part of the Reactor Vessel Internals in Section 2.3.1.2. Also included in the reactor coolant pressure boundary evaluation in Section 2.3.1.3 are the abandoned portions of ASME Code Class 1 SLC and process instrumentation piping and piping components associated with the reactor vessel pressure and liquid control nozzle (N-11).

The listed orifice (SLC-RO-1) is a blanking plate (an orifice with no hole), therefore it does not have a throttling function.

Table 2.3.3-41
Standby Liquid Control System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Drain pan	Structural Integrity
Orifice (SLC-RO-1)	Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Pump casing (SLC-P-1A, 1B)	Pressure Boundary
Sight glass	Structural Integrity
Tank (storage tank, SLC-TK-1)	Pressure Boundary
Tank (test tank, SLC-TK-2)	Structural Integrity
Tubing	Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.44 Standby Service Water (SW) System

System Description

The SW System includes vertical service water pumps located adjacent to the two spray ponds (1A and 1B) in two separate pump houses (1A and 1B). The pumps discharge to three independent piping systems, which serve ECCS equipment, auxiliary plant equipment, and reactor shutdown cooling equipment. The SW pumps consist of two independent 100% capacity pumps, each supplying normal and emergency shutdown cooling equipment. A third 100% capacity HPCS service water pump (housed in pump house 1A) supplies the HPCS System cooling equipment.

During the normal and emergency shutdown modes of operation, water is circulated from the spray ponds to the equipment requiring cooling, and returned to the ponds. The two SW systems return water via the spray rings prior to recycle. The HPCS service water returns directly to pond 1A with no sprays.

A small keep-full subsystem is attached to the SW System piping. The keep-full subsystem was originally designed to provide back pressure on the pump discharge valve so that maintenance repairs on the valve could be minimized (i.e., the keep-full subsystem was never intended to keep the system piping completely full). The pump discharge valve design and the system start sequence were changed so that back pressure on the pump discharge valve during the start sequence was no longer necessary. The SW System is able to start from a partially drained condition without damage to system components. The keep-full subsystem was therefore deactivated and spared in place, and no longer provides a design function.

Reason for Scope Determination

The SW System provides cooling for plant equipment essential to a safe reactor shutdown following a design basis LOCA, long-term cooling and a makeup water source to the fuel pool cooling system following a loss of the Reactor Closed Cooling Water System, and secondary containment integrity. These system-intended functions are safety-related. Therefore, the SW System meets the scoping criteria of 10 CFR 54.4(a)(1).

The SW System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The SW System does, however, contain NSR components that are attached to or located near SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the SW System meets the scoping criteria of 10 CFR 54.4(a)(2).

The SW System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events.

FSAR References

Section 9.2.7 of the FSAR describes the Standby Service Water System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M524-1, LR-M524-2, LR-M524-3, LR-M775, LR-M512-1

The evaluation boundaries for the SW System include the portion of the service water supply and return lines for the diesel cooling water heat exchanger (DCW-HX-1C) assigned by EPN to the Diesel Cooling Water (DCW) System, as shown on LR-M512-1.

Components Subject to AMR

Table 2.3.3-42 lists the component types that require AMR and their intended functions.

Table 3.3.2-42, Aging Management Review Results – Standby Service Water System, provides the results of the AMR.

Radiation elements SW-RE-4 and SW-RE-5, which function as radiation monitors, are active components and excluded from AMR s.

Flow elements that function as externally mounted ultrasonic flow meters (SW-FE-4 and SW-FE-5) do not perform a passive component intended function and are not subject to AMR.

Bolting in the SW pumps (HPCS-P-2, SW-P-1A, and SW-P-1B) is within the scope of license renewal. However, the bolting is replaced during the scheduled periodic refurbishment of the pumps. Therefore, the bolting is short-lived, subject to replacement based on a specified time period, and is not subject to AMR.

The motors, bearings, and mechanical seals for the SW pumps (HPCS-P-2, SW-P-1A, and SW-P-1B) perform their function with moving parts and are excluded from AMR as active components.

Two of the SW pumps (SW-P-1A and SW-P-1B) include an oil bath for bearing lubrication, with heat removed from the oil by a coiled cooling tube. These coiled cooling tubes are subject to AMR.

**Table 2.3.3-42
Standby Service Water System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Annubar	Pressure Boundary
Bolting	Pressure Boundary Structural Integrity
Expansion joint	Pressure Boundary
Flexible connection	Pressure Boundary
Heat exchanger (tubes and fittings)	Heat Transfer Pressure Boundary
Nozzle (spray ring)	Pressure Boundary Spray
Orifice	Pressure Boundary Structural Integrity Throttling
Piping	Pressure Boundary Structural Integrity
Pump casing	Pressure Boundary Structural Integrity
Strainer (body and screen)	Filtration Pressure Boundary
Tubing	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.3.45 Suppression Pool Temperature Monitoring (SPTM) System

System Description

The SPTM System provides suppression pool bulk temperature monitoring via sensors distributed around the pool. The system provides the main control room operator with the necessary information to avoid conditions that might lead to high-temperature steam quenching vibration phenomena.

The SPTM System consists of two separate divisions, each with 12 dual element thermocouples and multipoint recorder. The 24 channels are at eight locations evenly spaced around the perimeter of the pool. Sixteen channels are arranged in an upper ring while the remaining eight channels are mounted on a lower ring. Each quadrant contains four upper level and two lower level thermocouples. Average suppression pool temperature is recorded in the control room using data from eight channels, one per division per quadrant. Temperature indication from all 24 channels is available in the control room. Additionally, a separate indicator is available for direct readout of suppression pool average temperature.

Reason for Scope Determination

The SPTM System does not perform any safety-related system intended functions that meet the scoping criteria of 10 CFR 54.4(a)(1).

The SPTM System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The SPTM System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). Therefore, the SPTM System does not meet the scoping criterion of 10 CFR 54.4(a)(2).

The SPTM System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) and Anticipated Transients Without Scram (10 CFR 50.62) regulated events.

FSAR References

Section 7.6.1.7 of the FSAR describes the SPTM System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M519

Components Subject to AMR

The only SPTM components within the scope of license renewal are temperature elements. Since these instruments are specifically excluded from AMR in 10 CFR 54.21(a)(1)(i), there are no SPTM components that are subject to AMR.

2.3.3.46 Tower Makeup Water (TMU) System

System Description

The TMU System is designed to supply Columbia River water to the spray ponds to replace water lost during normal operation due to evaporation and drift. In addition, the TMU System is designed to replace pond water during a tornado. To ensure system availability for this mode of operation, the TMU System is designed to withstand a design basis tornado coincident with a loss of offsite power.

During a tornado or high wind condition, if there is damage to the service water spray header the Standby Service Water System is aligned for feed and bleed. Feed is provided from the TMU System and the system is aligned to bleed to the Circulating Water System.

Reason for Scope Determination

The TMU System does not perform any safety-related system intended functions that meet the scoping criteria of 10 CFR 54.4(a)(1).

The TMU System does not contain any NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). The TMU System does, however, contain NSR components that perform a 10 CFR 54.4(a)(1) function to support the once-through cooling mode of the Standby Service Water System to mitigate the consequences of a design basis tornado. This system-intended function is an NSAS function. Therefore, the TMU System meets the scoping criterion of 10 CFR 54.4(a)(2).

The TMU System is not relied upon to demonstrate compliance with, nor satisfy the 10 CFR 54.4(a)(3) scoping criteria for, any regulated event.

FSAR References

Sections 9.2.7.2 and 10.4.5.2 of the FSAR describe the Tower Makeup Water System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M507-1, LR-M524-1, LR-M524-2, LR-225-02,21, LR-225-02,22

Components Subject to AMR

Table 2.3.3-43 lists the component types that require AMR and their intended functions.

Table 3.3.2-43, Aging Management Review Results – Tower Makeup Water System, provides the results of the AMR.

The bolting in the TMU pumps (TMU-P-1A, 1B, and 1C) is within the scope of license renewal. However, the bolting is replaced during the scheduled periodic refurbishment of the pumps. As such the bolting is evaluated as short-lived, subject to replacement based on a qualified life or specified time period, and is not subject to AMR.

Table 2.3.3-43
Tower Makeup Water System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary
Expansion joint	Pressure Boundary
Orifice	Pressure Boundary Throttling
Piping	Pressure Boundary
Pump casing	Pressure Boundary
Strainer (body and screen)	Filtration Pressure Boundary
Tubing	Pressure Boundary
Valve body	Pressure Boundary

2.3.3.47 Traversing Incore Probe (TIP) System

System Description

The TIP System provides flux readings along the axial length of the core, which are obtained by fully inserting the traversing ion chamber into one of the calibration guide tubes, and then taking data as the chamber is withdrawn. The analog data is available for driving a recorder and for use by the process computer. One traversing ion chamber and its associated drive mechanism is provided for each group of seven to nine fixed in-core assemblies.

The TIP machines are comprised of a TIP detector, a drive mechanism, an indexing mechanism, and guide tubes.

The system allows calibration of local power range monitor (LPRM) signals by correlating TIP signals to LPRM signals as the TIP is positioned in various radial and axial locations in the core.

A valve system is provided with a valve on each guide tube entering the drywell. A ball valve and a cable shearing valve are mounted in the guide tubing just outside the drywell. The ball valves are closed except when the TIP is in operation. They maintain the leak tight integrity of the drywell. A valve is also provided for a nitrogen gas purge line to the indexing mechanisms. A guide tube ball valve opens only when the TIP is being inserted. The shear valve is used only if containment isolation is required and the ball valve cannot be isolated. The shear valve, which is controlled by a manually operated key lock switch, can cut the cable and close off the guide tube. The shear valves are actuated by explosive squibs.

Reason for Scope Determination

The TIP System provides Primary Containment isolation and integrity (including valve position indication). This system-intended function is safety-related. Therefore, the TIP System meets the scoping criteria of 10 CFR 54.4(a)(1).

The TIP System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The TIP System does, however, contain NSR components that are attached to or located near SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the TIP System meets the scoping criteria of 10 CFR 54.4(a)(2).

The TIP System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Section 7.7.1.6 of the FSAR describes the Traversing Incore Probe System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M604

Components Subject to AMR

Table 2.3.3-44 lists the component types that require AMR and their intended functions.

Table 3.3.2-44, Aging Management Review Results – Traversing Incore Probe System, provides the results of the AMR.

The nitrogen purge line for the TIP System is safety-related from the containment penetration up to the containment isolation valve (TIP-V-15). The attached NSR piping is included in the evaluation boundary up to the first seismic anchor and is subject to AMR.

The piping (guide tubes) for the TIP drives is safety-related from the containment penetration up to the ball and shear valves that perform the containment isolation function. The piping beyond the containment isolation valves continues as safety-related (seismic Class I) out to the end of the TIP chamber shields. The connected piping beyond the chamber shields is NSR. The chamber shields are NSR but serve as the anchors for the safety-related piping and are subject to AMR. As the piping between the isolation valves and the chamber shields is safety-related and is anchored by the chamber shields, failure of the attached NSR piping beyond the chamber shields cannot affect the function of the isolation valves. Therefore, the connected NSR piping between the chamber shields and the TIP drive mechanisms are not within the scope of license renewal.

Table 2.3.3-44
Traversing Incore Probe System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure Boundary Structural Integrity
Chamber shield	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Valve body	Pressure Boundary Structural Integrity

2.3.4 Steam and Power Conversion Systems

The steam and power conversion systems are those systems used as a heat sink to remove heat from the reactor and convert the heat generated in the reactor to the electrical output produced by the plant. The following Columbia systems are addressed in this section:

- Auxiliary Steam (AS) System (Section 2.3.4.1)
- Condensate (Auxiliary) (CO) System (Section 2.3.4.2)
- Condensate (Nuclear) (COND) System (Section 2.3.4.3)
- Main Steam (MS) System (Section 2.3.4.4)
- Main Steam Leakage Control (MSLC) System (Section 2.3.4.5)
- Miscellaneous Drain (MD) System (Section 2.3.4.6)
- Reactor Feedwater (RFW) System (Section 2.3.4.7)

A brief system description, reason for scope determination, associated FSAR references, associated license renewal drawings, and components subject to AMR information is provided for each system.

2.3.4.1 Auxiliary Steam (AS) System

System Description

The AS System normally operates only when the heating steam evaporators are inoperative during plant shutdown. The AS System then supplies steam to HVAC systems for air and water space heating and for humidification and also to radwaste systems. The AS System supplies steam to the nitrogen inerting steam vaporizer in the Containment Nitrogen System. The AS System can also supply sealing steam to the gland seal steam evaporator loads, including the turbine shaft seal glands.

The AS System consists of fuel oil storage tank and transfer pumps, auxiliary boiler, blowdown tank, chemical feed tank and metering pump, deaerator and boiler feed pumps, condensate return tank pumps, steam supply and condensate return piping and valves, and associated instruments and controls.

Reason for Scope Determination

The AS System provides isolation of the auxiliary steam line in the event of a high energy line break. This system-intended function is safety-related. Therefore, the AS System meets the scoping criterion of 10 CFR 54.4(a)(1).

The AS System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The AS System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the AS System meets the scoping criteria of 10 CFR 54.4(a)(2).

The AS System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Section 1.2.2.12.16 of the FSAR describes the Auxiliary Steam System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M513, LR-M783

Components Subject to AMR

Table 2.3.4-1 lists the component types that require AMR and their intended functions.

Table 3.4.2-1, Aging Management Review Results – Auxiliary Steam System, provides the results of the AMR.

Table 2.3.4-1
Auxiliary Steam System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Piping	Structural integrity
Strainer body	Structural integrity
Trap body	Structural integrity
Tubing	Structural integrity
Valve body	Pressure boundary Structural integrity

2.3.4.2 Condensate (Auxiliary) (CO) System

System Description

The CO System returns condensate from the Auxiliary Steam System, which operates only when the heating steam evaporators are inoperative during plant shutdown, to the Condensate Return Tank, by means of either the Radwaste Building Heating Condensate Pump Set (WHCO-CU-1) or the Condensate Pump Set (SHCO-CU-1).

Reason for Scope Determination

The CO System does not perform any safety-related system intended functions that meet the scoping criteria in 10 CFR 54.4(a)(1).

The CO System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The CO System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the CO System meets the scoping criteria of 10 CFR 54.4(a)(2).

The CO System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 1.2.2.12.16 of the FSAR describes the CO System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M513, LR-M783

Components Subject to AMR

Table 2.3.4-2 lists the component types that require AMR and their intended functions.

Table 3.4.2-2, Aging Management Review Results – Condensate (Auxiliary) System, provides the results of the AMR.

**Table 2.3.4-2
Condensate (Auxiliary) System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Structural integrity
Condenser	Structural integrity
Piping	Structural integrity
Pump casing	Structural integrity
Valve body	Structural integrity

2.3.4.3 Condensate (Nuclear) (COND) System

System Description

The COND System provides a source of water for testing and makeup during operation. Two condensate storage tanks are interconnected to simultaneously supply condensate to the main condenser via one header, to the CRD pumps via a second header, and to the RHR, RCIC, and HPCS systems and condensate supply and condensate filter and demineralizer backwash pumps via a third header. The storage tanks are normally cross-connected, but can be individually isolated from the system. The condensate supply pumps deliver condensate to miscellaneous services in the Reactor and Radwaste buildings. The condensate and feedwater systems also provide a reliable source of high purity feedwater during both normal operation and anticipated transient conditions.

A minimum inventory of 135,000 gallons in the condensate storage tanks is reserved for the RCIC and HPCS pumps. This ensures the immediate availability of a sufficient quantity of condensate for emergency core cooling, reactor shutdown, and station blackout, although the supply of water in the suppression pool is the emergency source of water.

Reason for Scope Determination

The COND System provides the normal water supply for the HPCS and RCIC pumps, and flush connections for the ECCS and the RHR shutdown cooling lines. These system-intended functions are safety-related. Therefore, the COND System meets the scoping criteria of 10 CFR 54.4(a)(1).

The COND System contains NSR components that perform a 10 CFR 54.4(a)(1) function to provide holdup in the main condenser (COND-HX-9) of the activity released from damaged fuel resulting from a postulated control rod drop accident. The COND System also contains NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the COND System meets the scoping criteria of 10 CFR 54.4(a)(2).

The COND System is relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for the Station Blackout (10 CFR 50.63) regulated event.

FSAR References

Sections 9.2.6 and 10.4.7 of the FSAR describe the Condensate (Nuclear) System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M504-2, LR-M526-1, LR-M527-1

Components Subject to AMR

Table 2.3.4-3 lists the component types that require AMR and their intended functions.

Table 3.4.2-3, Aging Management Review Results – Condensate (Nuclear) System, provides the results of the AMR.

The condenser tubes are not subject to AMR because they do not perform a license renewal intended function of the COND System.

Table 2.3.4-3
Condensate (Nuclear) System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Heat exchanger (shell)	Pressure boundary
Orifice	Pressure boundary Structural integrity Throttling
Piping	Pressure boundary Structural integrity
Pump casing	Structural integrity
Tank (COND-TK-1A, COND-TK-1B)	Pressure boundary
Tubing	Pressure boundary Structural integrity
Valve body	Pressure boundary Structural integrity

2.3.4.4 Main Steam (MS) System

System Description

The MS System is designed to deliver steam from the RPV to the main turbine. The MS System also provides steam to the moisture separator re-heaters and steam-jet air ejectors, gland seal steam evaporator, reactor feedwater pumps, offgas pre-heaters, the RCIC turbine, and balance-of-plant systems. The MS System provides a path for steam to the main condenser during startup and in the event that the steam produced by the reactor is less than the steam requirements of the turbine generator (bypass steam).

The main steam line piping consists of four lines extending from the RPV to the main steam header located upstream of the turbine stop and control valves. This header placement ensures a positive means of bypassing steam via the turbine bypass system during transient conditions and startup. Branch lines from the main steam line provide the steam requirements for the reactor feedwater pumps, second stage re-heaters, gland seal steam evaporator, offgas pre-heaters, and steam jet air ejectors.

Reason for Scoping Determination

The MS System:

- Provides main steam line isolation
- Provides reactor vessel overpressure protection
- Provides main steam relief valve (MSRV) depressurization mode (including support of alternate shutdown cooling)
- Provides MSRV automatic depressurization system (ADS) logic
- Provides removal of non-condensable gasses
- Provides nuclear boiler instrumentation (reactor trip, Primary Containment isolation, secondary containment isolation, ECCS support)
- Provides primary system pressure sensing and water level instrumentation
- Provides Primary Containment isolation and integrity (including valve position indication)
- Maintains reactor coolant pressure boundary integrity
- Provides capture of MSIV leakage
- Maintains main steam branch line integrity outboard of the MSIVs

These system-intended functions are safety-related. Therefore, the MS System meets the scoping criteria of 10 CFR 54.4(a)(1).

The MS System contains NSR components that perform a 10 CFR 54.4(a)(1) function to provide holdup in the low-pressure turbines of the activity released from damaged fuel resulting from a postulated control rod drop accident. The MS System also contains NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the MS System meets the scoping criteria of 10 CFR 54.4(a)(2).

The MS System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events.

FSAR References

Section 10.3 of the FSAR describes the Main Steam System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M529, LR-M530-1, LR-M502-1, LR-M502-2, LR-M528-2, LR-M506, LR-M505-2

Instruments assigned by EPN to the Reactor Protection System (RPS) are included within the evaluation boundaries of the MS System for completeness.

Instruments assigned by EPN to the Reactor Feedwater (RFW) System are included within the evaluation boundaries of the RFW System (see Section 2.3.4.7).

The line from containment penetration X-75b to the CRD and HPCS systems, and to which MS-DPT-32 is attached (see LR-M530-1 at G/12), is included within the evaluation boundaries of the CRD System (see Section 2.3.3.11).

Components Subject to AMR

Table 2.3.4-4 lists the component types that require AMR and their intended functions.

Table 3.4.2-4, Aging Management Review Results – Main Steam System, provides the results of the AMR.

The ASME Code Class 1 portions of the MS System, from the RPV to and including the outboard containment isolation valves (MS-V-28A, B, C, D), and including the MSRVs, are evaluated as part of the reactor coolant pressure boundary in Section 2.3.1.3. Also included in the reactor coolant pressure boundary evaluation are the ASME Code

Class 1 portions of the process instrumentation (PI) piping out to the excess flow check valves.

Per FSAR Section 10.3.2, the failure modes associated with the compressed air supply to the MSIV actuators (see LR-M529 Detail “A”) result in: (1) loss of compressed air due to loss of non-seismic air lines results in loss of pilot air and closure of the MSIV by both spring force and pneumatic air cylinder force, and (2) loss of compressed air due to loss of Seismic Category I air lines results in loss of both pilot air and actuator air with the MSIVs closing by spring force only. Under normal operation the air supply maintains the required air for holding the valve open and charging the air storage tank. The check valve at the air storage tank inlet ensures a pneumatic supply to assist in closing the MSIV. No safety-related makeup supply is required for closure of the MSIVs for safe plant shutdown. The removal of electrical power or failure of both the solenoids on the control valve automatically initiates closure of the MSIVs. Safety-related components ensuring removal of power to the solenoids when required are the only electrical power requirement. Therefore, the components associated with the compressed air supply to the MSIV actuators do not perform an intended function and are not subject to AMR.

Table 2.3.4-4
Main Steam System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Manifold	Pressure boundary
Moisture separator	Pressure boundary
Orifice	Structural integrity
Piping	Pressure boundary Structural integrity
Quencher	Pressure boundary Spray
Strainer body	Pressure boundary
Trap body	Structural integrity
Tubing	Pressure boundary
Turbine casing	Pressure boundary
Valve body	Pressure boundary Structural integrity

2.3.4.5 Main Steam Leakage Control (MSLC) System

System Description

The MSLC System associated with the main steam isolation valves is isolated and deactivated. The structural integrity of piping systems and components left in place is maintained.

Reason for Scoping Determination

The MSLC System provides Primary Containment isolation and integrity, and maintains the integrity of the reactor coolant pressure boundary. These system-intended functions are safety-related. Therefore, the MSLC System meets the scoping criteria of 10 CFR 54.4(a)(1).

The MSLC System is deactivated in place and does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The MSLC System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the MSLC System meets the scoping criteria of 10 CFR 54.4(a)(2).

The MSLC System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Section 6.7 of the FSAR describes the Main Steam Leakage Control System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M557

Components Subject to AMR

Table 2.3.4-5 lists the component types that require AMR and their intended functions.

Table 3.4.2-5, Aging Management Review Results – Main Steam Leakage Control System, provides the results of the AMR.

The components in the deactivated portions of the MSLC System are classified as Quality Class I. However, they have no safety function and for the purposes of AMR, are evaluated as NSR.

The filter housing (MSLC-F-2) is in scope for structural integrity, but the filter media does not perform an intended function and is not subject to AMR.

Table 2.3.4-5
Main Steam Leakage Control System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Annubar	Structural integrity
Bolting	Pressure boundary Structural integrity
Fan housing	Structural integrity
Filter housing	Structural integrity
Piping	Pressure boundary Structural integrity
Tubing	Structural integrity
Valve body	Pressure boundary Structural integrity

2.3.4.6 Miscellaneous Drain (MD) System

System Description

Equalizing lines connecting steam lines outside of the Primary Containment are used to equalize pressure across the main steam line isolation valves prior to restart following a steam line isolation. Assuming all steam line isolation valves have closed, the outer containment isolation valves are opened first and the MD System drain lines are used to warm up and pressurize the outside steam lines. Following warm-up, the inboard main steam line isolation valves are opened.

The MD System receives seal steam condensate drain flow (high-pressure and low-pressure stop valves, and governor valve), reactor feedpump turbine stage steam condensate flow, and reactor feedwater pump seal leakby flow.

Reason for Scoping Determination

The MD System does not perform a safety-related system intended function; however, components within the system are classified as safety-related by NRC commitment. Therefore, the Miscellaneous Drain System meets the scoping criteria of 10 CFR 54.4(a)(1).

The MD System contains NSR components that perform a 10 CFR 54.4(a)(1) function to provide a flowpath to the low-pressure turbines for holdup of the activity released from damaged fuel resulting from a postulated control rod drop accident (CRDA). The MD System also contains NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the MD System meets the scoping criteria of 10 CFR 54.4(a)(2).

The MD System is not relied upon to demonstrate compliance with the 10 CFR 54.4(a)(3) scoping criteria for any regulated events.

FSAR References

Sections 10.3.2 and 10.4.1 of the FSAR describes the Miscellaneous Drain System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M506

Components Subject to AMR

Table 2.3.4-6 lists the component types that require AMR and their intended functions.

Table 3.4.2-6, Aging Management Review Results – Miscellaneous Drain System, provides the results of the AMR.

Table 2.3.4-6
Miscellaneous Drain System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Orifice	Pressure boundary Structural integrity Throttling
Piping	Pressure boundary Structural integrity
Strainer body	Pressure boundary Structural integrity
Valve body	Pressure boundary Structural integrity

2.3.4.7 Reactor Feedwater (RFW) System

System Description

The RFW System provides a reliable source of high purity feedwater during both normal operation and anticipated transient conditions.

The RFW heaters (RFW-HX-6A, RFW-HX-6B) provide the final stage in a six heater regenerative feedwater cycle. The feedwater heaters are designed to provide the required temperature of feedwater to the reactor. The RFW heaters are split into two one-half capacity parallel strings. Two one-half nominal capacity turbine-driven RFW pumps (RFW-P-1A, RFW-P-1B) are provided. Each RFW pump is capable of providing two-thirds of the rated feedwater flow during one pump operation. Minimum flow through the RFW pumps is controlled by using recirculation control valves located in the pump discharge lines to permit recirculation of feedwater to the condenser. The feedwater control system automatically controls the flow of feedwater into the RPV to maintain the water level in the vessel within predetermined levels during all modes of plant operation.

Reason for Scope Determination

The RFW System provides Primary Containment isolation and integrity (including valve position indication), maintains reactor coolant pressure boundary integrity, and maintains nuclear boiler instrumentation integrity. These system-intended functions are safety-related. Therefore, the RFW System meets the scoping criteria of 10 CFR 54.4(a)(1).

The RFW System does not contain any NSR components that perform a 10 CFR 54.4(a)(1) function. The RFW System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the RFW System meets the scoping criteria of 10 CFR 54.4(a)(2).

The RFW System is relied upon to demonstrate compliance with, and meets the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

FSAR References

Section 10.4.7 of the FSAR describes the Reactor Feedwater System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M504-2, LR-M529

The ASME Class 1 portions of the RFW System are addressed with the reactor coolant pressure boundary in Section 2.3.1.3.

Components Subject to AMR

Table 2.3.4-7 lists the component types that require AMR and their intended functions.

Table 3.4.2-7, Aging Management Review Results – Reactor Feedwater System, provides the results of the AMR.

The small-bore lines to flow transmitters RFW-FT-802A and 802B are decoupled from the piping analysis, and are therefore not in scope.

The flow meter section is in scope only for NSAS; therefore, the internals, including the flow straighteners and the nozzles are not in scope.

Table 2.3.4-7
Reactor Feedwater System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Structural integrity
Flow element	Structural integrity
Piping	Structural integrity
Valve body	Structural integrity

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

The determination of the structures within the scope of license renewal is made through the application of the process described in Section 2.1. The results of the structural scoping review are in Section 2.2.

Section 2.1 also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The components that meet these screening requirements are identified in this section.

The screening results for structures consist of lists of components and commodities that require AMR. Brief descriptions of the structures within the scope of license renewal are provided as background information. Structural intended functions are described for in-scope structures.

The structures in the scope of license renewal are the:

- Primary Containment [Includes Drywell, Suppression Chamber, and internal structural components] (Section 2.4.1)
- Reactor Building [Includes Secondary Containment, Reactor Cavity, Refueling Area, New Fuel Storage Vault, and Release Stack] (Section 2.4.2)
- Standby Service Water Pump House 1A and 1B and Spray Pond 1A and 1B (Section 2.4.3)
- Circulating Water Pump House (Section 2.4.4)
- Diesel Generator Building (Section 2.4.5)
- Fresh Air Intake Structure No. 1 and 2 (Section 2.4.6)
- Makeup Water Pump House (Section 2.4.7)
- Radwaste Control Building (Section 2.4.8)
- Service Building (Section 2.4.9)
- Turbine Generator Building (Section 2.4.10)
- Water Filtration Building (Section 2.4.11)
- Yard Structures (Section 2.4.12)

  Note: Yard Structures includes Circulating Water Basin; Condensate Storage Tank Foundations and Retaining Area; Cooling Tower Basins; Diesel Fuel Polishing Building; Fire Water Bladder Tank Embankment; Hydrogen Storage and Supply Facility; Mobile Fire Response Vehicle and Trailer; Station Blackout component foundations and structures in the yard; Duct banks, cable trenches, manholes, valve pits, and electrical towers.

Structural components for in-scope structures are addressed in the structure reviews (Section 2.4.1 through 2.4.12).

Structural commodities (e.g., anchorages, instrument panels, cable trays, conduits, fire seals, fire doors, equipment and component supports, etc.) are addressed in the bulk commodities review (Section 2.4.13).

2.4.1 Primary Containment [Includes Drywell, Suppression Chamber, and internal structural components] – Seismic Category I

Structure Description

The primary containment vessel is a free-standing steel pressure vessel. It utilizes the pressure suppression technique through the Mark II over-under configuration. The primary containment vessel and its appurtenances comply with the requirements of the ASME Code, Section III, Subsection NE-Class MC Components, 1971 Edition through Summer 1972 Addenda. The drywell floor that divides the drywell and suppression chamber is a reinforced concrete slab supported by steel beams and concrete columns. The drywell floor to primary containment vessel gap is closed off by means of a floor seal. The primary containment vessel is enclosed in a reinforced concrete biological shield wall for shielding purposes and is separated from the reinforced concrete by an annulus of compressible isolation material. The concrete biological shield wall is addressed in Section 2.4.2 and the compressible isolation material is addressed in Section 2.4.13. The drywell is located directly above the suppression chamber. The drywell configuration is basically a frustum of a cone with removable ellipsoidal top closure head. The suppression chamber (wetwell) is cylindrical with an ellipsoidal base. The primary containment vessel is provided with two concentric circular skirts on the bottom ellipsoidal head integral with the vessel that are anchored to the concrete mat foundation. The primary containment vessel is reinforced with vertical and horizontal stiffeners to satisfy design requirements of the various loading combinations and conditions. The bottom of the suppression chamber is lined on the inside with reinforced concrete. The concrete mat foundation under the suppression chamber is a common foundation supporting the steel primary containment vessel, including all equipment and structures therein, and the Reactor Building of which the primary containment vessel is a part.

The Primary Containment is inerted with nitrogen during normal plant operation. As such, the environment will not sustain a fire and no safe shutdown path is analyzed for these fire areas.

The Primary Containment consists of the following major structural components and design considerations:

- Access Hatches (personnel access lock, the (combined) equipment hatch and CRD removal hatch, and the suppression chamber access hatch) - The drywell has one manually operated personnel air lock. This air lock consists of a cylindrical shell with two doors, one at each end of the shell. The air lock doors are interlocked to ensure that at least one door is locked when Primary Containment integrity is required. The locking mechanisms are designed so that tight seals are maintained when the doors are subject to either the design internal or external pressure.

The drywell has one equipment removal hatch. The equipment hatch cover is dished and has steel stiffeners. The equipment hatch and cover are entirely supported by the steel primary containment vessel. Double compressible seals with an air space between them are used to permit leak testing at any time. Included within the equipment hatch cover is a CRD removal hatch with a hinged cover. The CRD removal hatch is provided with leak-testable, double-gasketed seals.

The suppression chamber access hatch is supported by the vessel and has a leak-testable, double-gasketed, bolted cover that is normally closed and is opened only when primary containment is not required.

- <u>Pipe Whip Protection Support Rings</u> - Pipe whip protection support rings, which are fully circumferential rings, are attached to the primary containment vessel. The basic function of these rings is to support pipe whip protection framework and to adequately distribute pipe whip loading into the vessel.
- <u>Drywell Floor</u> - The drywell floor structural system (aka diaphragm floor) consists of an outer annulus made of a reinforced concrete slab supported by structural steel beams in composite action, by reinforced concrete columns and by the reinforced concrete pedestal. The inner circular reinforced concrete slab (inside the reactor pedestal) is constructed monolithically with, and supported by, the reactor pedestal. There are downcomer vent pipes that provide the flow paths for uncondensed drywell steam into the suppression chamber pool. The upper part of each downcomer is embedded in and supported by the reinforced concrete slab of the drywell floor. A horizontal steel plate ring, welded to each downcomer and embedded in the slab, serves as a downcomer support and as a seal in preventing leakage through the drywell floor. A jet deflector is provided at each downcomer to prevent the direct impingement of a fluid jet onto the downcomer from a pipe break.
- <u>Drywell Floor Peripheral Seal Assembly</u> - The drywell floor peripheral seal is welded to the primary containment vessel and to the underside of the circular closure girder embedded in the drywell floor. It is a 270 degree segment of a stainless-steel pipe in cross section, circular in plan, and is drained to the floor drain system, which is routed to a point outside of Primary Containment. Jet deflectors are provided at the seal to prevent the direct impingement of a fluid jet force on the seal due to a pipe break. To prevent differential lateral and torsional movements, shear lugs are furnished along the outer periphery of the drywell floor to ensure that movements of the interfacing drywell floor, floor seal, and primary containment vessel are in unison during seismic events. The design of Columbia Mark II containment drywell floor does not have the moisture barrier typically found in Mark I boiling water reactors at the concrete floor to primary containment vessel interface.

- Drywell Head - The drywell containment head is removed during refueling operations. This head is held in place by bolts and is sealed with a double seal. It is bolted closed when primary containment is required and is opened only when primary containment is not required. The gasket seal is capable of limiting the leakage to below the design rate and is capable of being independently tested.
- Drywell Sumps - Two drywell drain sumps are located in the under-vessel area of Primary Containment for collection of leakage. The normal design leakage collected in the drywell floor drain sump consists of leakage from the CRDs, valve flange leakage, floor drains, closed cooling water system drywell cooling unit drains, and potential valve stem leaks. The floor drain sump collects unidentified leakage. The drywell equipment drain sump collects only identified leakage. This sump receives condensate drainage from pump seal leakoff and the reactor vessel head flange vent drain. Collection in excess of background leakage would indicate reactor coolant leakage. The drywell floor drain sump and the drywell equipment drain sump are stainless steel lined.
- Sand Filled Pocket Area - A sand filled pocket area is provided at the surrounding exterior of the primary containment vessel near the base. The sand filled pocket area is used to collect any drainage between the primary containment vessel exterior and the biological shield wall. An embedded steel closure ring is installed on the top of the sand filled transition area.
- Penetrations - Two general types of pipe penetrations are provided. The two types differ depending on whether the penetration is subject to a hot or cold operational environment. The cold penetrations pass through the steel primary containment vessel and are welded directly to it. The piping is normally welded directly to the penetration nozzles. The hot penetrations and multiple piping penetrations do not come in direct contact with the steel shell of the primary containment vessel. These penetrations pass through vessel shell nozzles that are welded to the steel shell of the primary containment vessel and function as thermal sleeves. Containment closure is accomplished by means of closure plates or flued head fittings, welded to the penetration nozzle and the piping at a suitable distance outside the containment shell. The piping design includes the effects of seismic and thermal motion of the primary containment vessel shell at the penetration connections. Bellows type seals are not used for Columbia.

  Containment electrical penetrations are designed to safely accommodate all of the electrical requirements within the containment boundary. These are functionally grouped into low voltage power and control cable penetrations assemblies, medium voltage power cable penetration assemblies, signal cable penetration assemblies, and thermocouple cable penetration assemblies. The medium voltage power cable electrical penetrations are canister type assemblies sized to be inserted into the primary containment vessel penetration nozzles. All other electrical penetrations are a unitized header plate assembly attached to the outboard end of the primary containment vessel penetration nozzles.

- Suppression Chamber- The suppression chamber (aka, pressure suppression chamber, wetwell) is cylindrical with an ellipsoidal base. The bottom of the suppression chamber is lined on the inside with reinforced concrete. Vertical stiffeners and horizontal stiffener rings are incorporated in the design of the suppression chamber.
- Radial Beam Framing Systems - Structural steel beams span radially from support points on the sacrificial shield wall (SSW) and reactor pedestal to the primary containment vessel to form radial beam systems at various levels. The beam seats provided on the primary containment vessel to support the radial beams are designed to support the beams vertically and tangentially and to allow the beams to move freely in the radial direction. The beam seats are also designed to account for differential motions of the primary containment vessel at one end of the beam and the SSW and reactor pedestal at the other end.
- Reactor Pedestal - The reactor pedestal is a vertical cylindrical shell-type reinforced concrete foundation. This foundation supports the RPV and the SSW. The bottom of the RPV skirt and the SSW are anchor-bolt-connected directly to the top of the reactor pedestal. The bottom of the reactor pedestal is keyed into the reinforced concrete liner inside the bottom head of the primary containment vessel.
- Reactor Vessel Thermal Insulation - The insulation panels for the cylindrical shell of the vessel are self-supporting, with seismic restraints attached to the SSW. The insulation is designed to be removable over those portions of the vessel where required for the purpose of in-service inspection.
- Refueling Bellows Seal- The drywell of the primary containment vessel is isolated by means of an inner refueling bellows seal, of flexible stainless steel, at the top head flange of the reactor vessel. The inner refueling bellows seal, which is welded to both the reactor vessel and the bulkhead plate, serves to seal the gap between the reactor vessel and the primary containment vessel. The polyurethane-filled gap between the primary containment vessel and the biological shield wall is kept dry by means of an outer refueling bellows seal at the top head flange of the primary containment vessel. The outer refueling bellows seal is welded between the primary containment vessel and the biological shield wall, which seals the space between the primary containment vessel and the biological shield wall.
- Reinforced Concrete Lining Inside the Bottom Head of the Primary Containment Vessel - The reinforced concrete lining inside the bottom head of the primary containment vessel facilitates the design and construction of concrete structures in the suppression chamber by providing the means, through a like material for attaching their bases, particularly for attaching the base of the reactor pedestal

with a continuous connection to the Reactor Building foundation mat that transfers all the load directly to the mat, with no residual concentrated load transferred to the bottom ellipsoidal head. In addition, the liner inside the vessel bottom head and the concrete fill on the outside of the bottom head sandwich the bottom head in such manner as to enhance the distribution of uniform type loads. The concrete liner is anchored to the vessel bottom head by means of headed stud shear connectors welded to the vessel bottom head.

- Sacrificial Shield Wall - The sacrificial shield wall is a non-reinforced concrete structure two feet thick, lined on the inside and outside by steel plates.
- Stabilizer Truss- The Reactor Building stabilizer truss and the RPV stabilizer are important components in the structural system supporting the reactor vessel. The system is designed to interact with the Reactor Building and the primary containment vessel via their connections at the Reactor Building foundation mat level, drywell floor level, and the top of the SSW level through the reactor vessel shear lugs, shear lug stabilizers, SSW, and stabilizer truss interfaces.

Reason for Scope Determination

The Primary Containment is within the scope of license renewal as a safety-related structure, which meets the criteria of 10 CFR 54.4(a)(1). The Primary Containment, in combination with other accident mitigation systems, limits fission product leakage during and following the postulated design basis accident to values less than leakage rates that would result in offsite doses greater than those set forth in 10 CFR 50.67. The Primary Containment provides support and protection for equipment, and supports the ability to maintain required temperatures for operation.

The Primary Containment is relied upon to demonstrate compliance with the Station Blackout (10 CFR 50.63) and Anticipated Transients Without Scram (10 CFR 50.62) regulated events and meets the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the Primary Containment is in the scope of license renewal because it contains:

- Structural components that are safety-related and are relied upon to remain functional during and following design basis events.
- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.
- Structural components that are relied on during anticipated transients without scram and station blackout events.

FSAR References

Sections 3.8.2 and 3.8.3 of the FSAR describe the Primary Containment and its major structural components.

Components Subject to AMR

Table 2.4-1 lists the component types that require AMR and their intended functions.

The structural commodities for the Primary Containment are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-1, Aging Management Review Results - Primary Containment, provides the results of the AMR.

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

Component Type	**Intended Function (as defined in Table 2.0-1)**
Concrete Under the Ellipsoidal Head	SSR
Downcomer Bracing and Supports	SSR
Downcomer Jet Deflectors	HELB, SSR
Drywell Floor	EN, FLB, MB, SSR, SRE
Drywell Floor Decking	SSR
Drywell Floor Peripheral Seal Assembly	DF, EN, EXP, SPB, SSR
Drywell Floor Peripheral Seal Jet Deflectors	HELB, SSR
Drywell Floor Shear Lugs	SSR
Drywell Floor Support Columns	SSR
Drywell Head (including drywell head flanges, lifting lugs, support feet, and double o-rings)	EN, SPB, SSR
Drywell Sump Liners	SSR
Drywell Sumps	DF, FLB, SSR
Equipment Hatch and CRD Removal Hatch (including flange gaskets and closure mechanisms)	EN, SPB, SSR
Floor Trench	DF, SSR

Table 2.4-1: Primary Containment (continued)	
Component Type	**Intended Function (as defined in Table 2.0-1)**
Penetrations (Mechanical and Electrical, primary containment boundary)	EN, SPB, SSR
Personnel Access Lock (including gaskets, hatch locks, hinges and closure mechanisms)	EN, SPB, SSR
Pipe Whip Protection Support Rings	EN, PW, SSR
Primary Containment Vessel	EN, SPB, SRE, SSR
Primary Containment Vessel Inner and Outer Support Skirts	SPB, SSR
Quencher Support	SSR
Radial Beam Framing System	EN, SSR
Reactor Pedestal	SSR
Reactor Vessel Thermal Insulation	EN, PR, SSR
Refueling Bellows Seals	EXP,FLB, SSR
Refueling Bulkhead Seal Plate	FLB, SSR
Reinforced Concrete Lining Inside the Bottom Head of the Primary Containment Vessel	SSR
Sacrificial Shield Wall	EN, MB, SHD, SNS, SSR
Sacrificial Shield Wall Inner and Outer Skins (including removable plugs, shield doors, and removable panels)	EN, SHD, SNS, SSR
Sand Filled Pocket Area (including closure ring)	DF, FLB, SSR
Stabilizer Truss	SSR
Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SNS, SSR
Suppression Chamber (including bottom ellipsoidal head, vertical stiffeners and horizontal stiffener rings)	EN, HS, SPB, SRE, SSR
Suppression Chamber Access Hatch (including flange gaskets and closure mechanisms)	EN, SPB, SSR

2.4.2 Reactor Building [Includes Secondary Containment, Reactor Cavity, Refueling Area, New Fuel Storage Vault, and Release Stack] – Seismic Category I

Structure Description

The Reactor Building is part of the secondary containment system. The Reactor Building completely encloses the reactor vessel and the steel primary containment vessel and provides secondary containment when the primary containment vessel is sealed and in service. When the primary containment vessel is open during refueling periods the Reactor Building also provides primary containment. The Reactor Building houses refueling and reactor servicing equipment, fuel storage facilities (new and spent), RCIC System, RWCU System, SLC System, CRD System, ECCS, and SGT System equipment, and electrical equipment components. An elevated release vent is constructed integrally with the concrete and steel superstructure exterior walls of the Reactor Building, for the ventilation equipment located in the building.

The Reactor Building is a cast-in-place, reinforced concrete diaphragm slab and shear wall type structure up to and including the refueling floor. Above the refueling floor, the building structure is constructed of structural steel members and insulated metal siding and roof decking. Joints in the superstructure paneling are designed to ensure adequate air leak tightness. The steel superstructure supports the overhead bridge crane and houses refueling operations. The foundation mat is a common foundation supporting the steel primary containment vessel and all equipment and structures installed and erected therein, and the Reactor Building that encloses the primary containment vessel.

The Reactor Building, Radwaste and Control Building, Turbine Generator Building, Diesel Generator Building, and the Service Building are grouped together to form the plant complex. However, the buildings are separated from each other by gaps and are supported on separate foundation mats.

The Reactor Building consists of the following major structural components and design considerations:

- The lowest floor surface in the Reactor Building is the top of the foundation mat at elevation 422 feet 3 inches mean sea level (msl). Uplift and increased lateral hydrostatic pressure are considered in the design of all Seismic Category I structures and safety-related systems and components, to ensure their safety in the event of a rise in the groundwater table to 420 feet msl. The design basis groundwater elevation used for subsurface hydrostatic loadings is 420 feet msl and was predicated on the possible future construction of the Ben Franklin Dam. However, planning for the dam has been terminated. The present groundwater elevation is at 380 ft msl.

- Flooding from external sources does not occur as discussed in the FSAR. Continuous waterstops are provided in all horizontal and vertical construction joints in exterior walls and interior walls between and including the top of the foundation mat, which is slightly above the operating level of the suppression chamber pool. Continuous waterstops are also provided in all construction joints in the reinforced concrete slab in the vehicle air lock (railroad bay). In addition, all pipe sleeves and penetrations through side walls and floor slabs are designed to minimize flooding effects as prescribed by specific construction details.
- The Reactor Building is maintained at a negative pressure of 0.25 inches water gauge with respect to atmosphere during normal operation by the Reactor Building heating and ventilating systems to minimize release of airborne radioactive material. During emergency operation, the SGT System maintains the Reactor Building at a negative pressure.
- An elevated release stack is provided to release the effluent gases from the reactor building ventilation exhaust, the condenser offgas system, the condenser vacuum pump system, and the SGT System.
- The refueling pools are located at the refueling floor and include the fuel storage pool (aka, spent fuel storage pool), dryer-separator storage pool, and reactor refueling pool (aka, reactor well). The inside surface of the pools are lined with seam-welded stainless steel plate liners, which serve as leak tight barriers. Rolled carbon steel structural shapes, such as angle and channel sections, are welded directly to the concrete side of the liner along the liner seams and are monitored to detect seam leakage from the pools and, in the event of a leak, serve as liner drains. Sealed double-layer aluminum alloy gates and sealed reinforced concrete plugs, between the dryer-separator pool and the reactor cavity, are designed to maintain water to the top of the dryer-separator pool even if the reactor refueling pool is drained for maintenance purposes. The walls and bottom slab thicknesses of the pools are adequate to provide the required biological shielding. The spent fuel cask storage area is separated from the new and spent fuel storage area by concrete walls within the fuel pool.
- New fuel is placed in dry storage in the new fuel storage vault, which is located inside the Reactor Building at the refueling floor level. The storage vault within the Reactor Building provides adequate shielding for radiation protection. Storage racks are designed to preclude accidental criticality. The new fuel storage rack castings are made from aluminum and are secured by stainless steel fasteners.
- Irradiated fuel is stored in the spent fuel pool in the Reactor Building. Fuel pool water is circulated through the Fuel Pool Cooling System to maintain fuel pool water temperature, purity, water clarity, and water level. Storage racks are designed to preclude accidental critically. The spent fuel storage rack design consists of fuel storage cells that are square stainless steel tubes with boron

carbide (B_4C) neutron absorbing plates between them. A stainless steel plate grid at the top and the bottom of the tubes, to which the tubes are welded, form the tubes into racks. The racks are welded together into modules, which are held firmly in place by seismic restraints attached between the rack modules and the pool wall. The storage racks are made of stainless steel.

- All entrances to the Reactor Building are through interlocking double door air lock systems, so that building ingress and egress does not jeopardize the integrity of the secondary containment. Penetrations of the Reactor Building are designed with leakage characteristics consistent with leakage requirements of the entire building. In addition, all openings such as personnel doors leading into the secondary containment are under administrative control and are provided with position indication, and alarm in the control room if they are opened.
- The biological shield wall is a major structure enclosed by the Reactor Building. The wall completely encloses the steel primary containment vessel. The biological shield wall is separated from the primary containment vessel by an annulus of compressible isolation material. The top of the shield wall (the reactor refueling cavity) is closed by means of removable, segmented, reinforced concrete shield plugs. The biological shield wall is a reinforced concrete structure. The main function of the biological shield wall is to serve as a radiation shield around the primary containment vessel. It also functions as a major mechanical barrier for the protection of the containment and reactor system against missiles that may be generated external to the Primary Containment.
- The reinforced concrete main steam tunnel and tunnel extension enclose the four main steam-to-turbine pipe lines, the two feedwater-to-reactor vessel pipe lines, and a portion of the reactor water cleanup return line that connects to the reactor feedwater lines. Blowout panels are placed at the north end and at the east side of the main steam tunnel.
- The Reactor Building crane is a single-trolley top-running electric overhead traveling crane with a 125-ton capacity main hoist. The crane is Class A1 as defined for nuclear fuel handling by the Crane Manufacturers Association of America Specification No. 70 for Electric Overhead Traveling Cranes, (CMAA No. 70). The Reactor Building crane is designed, fabricated, installed, and tested in accordance with ANSI Standard B30.2, Safety Code for Cranes, Derricks and Hoists, and CMAA Specification No. 70. The crane is Seismic Category I and single failure proof.
- The refueling platform is General Class G and Seismic Category 1M from a structural standpoint in accordance with 10 CFR Part 50, Appendices A and B. The refueling platform is a gantry crane that is used to transport fuel and reactor components to and from pool storage and the reactor vessel. The platform spans the fuel storage and vessel pools on rails bedded in the refueling floor.

Reason for Scope Determination

The Reactor Building is within the scope of license renewal as a safety-related structure, which meets the criteria of 10 CFR 54.4(a)(1). The function of the Reactor Building is to control the release of the radioactivity to the environment, provide support and protection for equipment, and support the ability to maintain required temperatures for operation.

The Reactor Building is relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events and meets the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the Reactor Building is in the scope of license renewal because it contains:

- Structural components that are safety-related and are relied upon to remain functional during and following design basis events.
- Structural components which are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.
- Structural components that are relied on during postulated fires, anticipated transients without scram, and station blackout events.

FSAR References

Section 3.8.4 of the FSAR describes the Reactor Building.

Components Subject to AMR

Table 2.4-2 lists the component types that require AMR and their intended functions.

The structural commodities for the Reactor Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-2, Aging Management Review Results - Reactor Building, provides the results of the AMR.

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

Component Type	Intended Function (as defined in Table 2.0-1)
Biological Shield Wall	EN, MB, SHD, SSR
Blowout Panels	SPB, SSR
Cranes, including Bridge, Trolley, Rails, and Girders	SNS, SSR
Elevated Release Stack	RP, SSR
Exterior Walls (above grade)	EN, MB, SSR
Exterior Walls (below grade)	EN, SSR
Foundations	EN, EXP, SSR
Lead Shield Panels	SHD, SNS
Main Steam Tunnel	EN, HELB, MB, PW, SHD, SSR
Metal Siding	EN, SPB, SSR
New Fuel Racks	EN, SSR
New Fuel Storage Vault and Cover	EN, SSR
Pipe Chase	EN, SHD, SSR
Pump Pits	SSR
Reactor Well and Dryer-Separator Storage Pool Gates	SSR
Reactor Well and Dryer-Separator Storage Pool Liners	SSR
Refueling Pools (spent fuel, reactor well, dryer-separator pools)	EN, SHD, SSR
Reinforced Concrete: Walls, Floors, and Ceilings	EN, FB, FLB, HELB, MB, SHD, SNS, SRE, SSR
Roof Decking	EN, SPB, SSR
Roof Masts	SRE
Secondary Containment Air Locks (includes railroad bay and double air lock doors)	MB, SPB, SSR

Table 2.4-2: Reactor Building (continued)	
Component Type	**Intended Function (as defined in Table 2.0-1)**
Shield Plugs	EN, SHD, SSR
Shield Walls	SHD, SNS
Spent Fuel Pool Gates	SSR
Spent Fuel Pool Liner	SSR
Spent Fuel Rack Neutron Absorbers	ABN, SSR
Spent Fuel Storage Racks	SSR
Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SSR
Sump Liners	SNS
Sumps	SNS

2.4.3 Standby Service Water Pump House 1A and 1B and Spray Pond 1A and 1B – Seismic Category I

Standby Service Water Pump Houses – Seismic Category I

Structure Description

Two Standby Service Water Pump Houses (1A and 1B) and two Spray Ponds (1A and 1B) are located southeast of the main plant complex. Each pond is constructed integrally with a Standby Service Water Pump House. Each pair of structures consisting of pond and pump house is adjacently located, but structurally separated.

Each of the two Standby Service Water Pump Houses has one standby service water pump. Standby service water pump house 1A also houses the HPCS service water pump. Other equipment within the Standby Service Water Pump Houses includes electrical, HVAC, and instrumentation equipment. The intakes house wire mesh water screens (sandwiched between removable galvanized steel frames) behind removable all-steel framed stop logs (stop log is only installed for maintenance and is not installed during normal operation). An under hung overhead bridge crane is supported by monorails, which, in turn, are supported by reinforced concrete roof beams.

The Standby Service Water Pump Houses are cast-in-place reinforced concrete structures. They are supported on foundations consisting of spread footings and foundation mats. Each structure has four levels: the foundation slabs at the bottom of the pump chambers, the electric vault and valve pit level, the superstructure main operating floor level, and the roof.

The Standby Service Water Pump Houses are designed to resist the increased hydrostatic pressure, which would result from the rise in the groundwater to elevation 420 feet msl. Seismic Category I structures and safety-related systems and components are located above the present groundwater elevation 380 feet msl and are not subject to any force effects of buoyancy and static water from this groundwater elevation. The design basis groundwater elevation used for subsurface hydrostatic loadings is 420 feet msl and was predicated on the possible future construction of the Ben Franklin Dam. However, planning for the dam has been terminated.

Each Standby Service Water Pump House consists of the following major structural components and design considerations:

- The Standby Service Water Pump House foundation consists of three types of foundations. The pump inlet bay portion of the pump house is depressed to the same elevation as the pond sump. The concrete walls that form the pump inlet bay and support portions of the building are also supported on this mat. The face of the pump house that is adjacent to the Spray Pond is supported by a reinforced concrete retaining wall common to both the pump house and the

Spray Pond. The balance of the pump house is supported by reinforced concrete columns and spread footings.

- The bottom of the pump sump is depressed below the pond bottom. This ensures that there is still sufficient submergence for the pumps at the lowest possible water level in the pond. A sand trap and screen precede the pump sump to prevent heavy debris from entering the pump sump area. A skimmer wall and fixed screen prevent floating debris from entering the pumps.
- The exterior walls and roofs of both pump houses are constructed of reinforced concrete and are adequate to withstand design-basis tornado-generated missiles.
- The Standby Service Water Pump Houses are credited in the fire protection program as remote buildings. However, since the remote buildings are sufficiently separated from each other and from the plant, a single exposure fire would not spread to more than one building. The structural elements of the Standby Service Water Pump Houses (e.g., reinforced concrete walls, floors, and ceilings) therefore are not credited to perform a fire barrier intended function.

Reason for Scope Determination

The Standby Service Water Pump House is within the scope of license renewal as a safety-related structure, which meets the criteria of 10 CFR 54.4(a)(1). The function of the Standby Service Water Pump House is to provide support and protection for equipment and support the ability to maintain required temperatures for operation.

The function of the Standby Service Water Pump Houses, in conjunction with the Spray Ponds, is to provide a source of cooling water for the RHR, HPCS, LPCS, and Fuel Pool Cooling systems, and the essential HVAC systems.

The Standby Service Water Pump House is relied upon to demonstrate compliance with Anticipated Transients Without Scram (10 CFR 50.62) and Station Blackout (10 CFR 50.63) regulated events and meets the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the Standby Service Water Pump House is in the scope of license renewal because it contains:

- Structural components that are safety-related and are relied upon to remain functional during and following design basis events.
- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.
- Structural components that are relied on during anticipated transients without scram and station blackout events.

Spray Ponds – Seismic Category I

Structure Description

The ultimate heat sink consists of two man-made Seismic Category I Spray Ponds and is designed to withstand extreme natural phenomena. The standby service water pumps take suction from the Spray Ponds and pump water through the various heat exchangers and coolers required for normal and emergency shutdown. The water is returned to the Spray Ponds through the spray distribution piping.

The Spray Pond structures are reinforced concrete rectangular-shaped retention basins consisting essentially of a structural slab on soil and four perimeter exterior walls. Continuous waterstops are furnished in all joints such as construction joints and expansion joints and, together with the membrane vapor barrier under the floor slab, provide protection against leakage of water stored in the ponds. A sand trap for sediment retention is built integrally with each pond immediately prior to the stop logs and screens in the pump barrel intake chambers of each Standby Service Water Pump House.

Each Spray Pond consists of the following major structural components and design considerations:

- The two reinforced concrete Spray Pond structures have the capability to tolerate tornado generated missiles. The walls and slab are bounded by Quality Class I high relative density backfill. On this basis, missile protection is provided for the pond structures. A direct hit by a tornado-generated design basis missile resulting in localized floor and wall penetration is unlikely because of the protection provided by the backfill and the water in the pond.
- The Spray Ponds and pump houses are located at sufficient elevation and distance from the Columbia River; the effects of the design basis flood including wind wave action and spray do not require flood protection measures.
- The Spray Ponds are designed to resist the increased hydrostatic pressure that would result from the rise in the groundwater to elevation 420 feet msl. The design basis groundwater elevation used for subsurface hydrostatic loadings is 420 feet msl and was predicated on the possible future construction of the Ben Franklin Dam. However, planning for the dam has been terminated.

Reason for Scope Determination

The Spray Pond is within the scope of license renewal as a safety-related structure, which meets the criteria of 10 CFR 54.4(a)(1). The function of the Spray Pond (ultimate heat sink) is to impound and supply cooling water to remove heat from all nuclear plant equipment that is essential for a safe and orderly shutdown of the reactor and to maintain it in a safe condition.

The function of the Spray Ponds, in conjunction with the Standby Service Water Pump Houses and the Standby Service Water System, is to remove heat from plant systems that are required for a safe reactor shutdown following a LOCA. The system is designed to remove reactor decay heat from the RHR System during normal plant shutdown. The system is designed to provide a means of flooding the vessel and containment, if required during the post-LOCA period. The system is designed to provide a long-term cooling and makeup source to the Fuel Pool Cooling System following a loss of the Reactor Closed Cooling Water System, which is the normal source of cooling to the Fuel Pool Cooling System.

The Spray Pond is relied upon to demonstrate compliance with Anticipated Transients Without Scram (10 CFR 50.62) and Station Blackout (10 CFR 50.63) regulated events and meets the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the Spray Pond is in the scope of license renewal because it contains:

- Structural components that are safety-related and are relied upon to remain functional during and following design basis events.
- Structural components that are relied on during anticipated transients without scram and station blackout events.

FSAR References

Section 3.8.4 of the FSAR describes the Standby Service Water Pump Houses and the Spray Ponds.

Components Subject to AMR

Table 2.4-3 lists the component types that require AMR and their intended functions.

The structural commodities for the Standby Service Water Pump House are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-3, Aging Management Review Results – Standby Service Water Pump House 1A and 1B and Spray Pond 1A and 1B, provides the results of the AMR.

Table 2.4-3
Standby Service Water Pump House 1A and 1B and Spray Pond 1A and 1B Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Barrier Skimmer Wall	SRE, SSR
Bulkhead Fixed Screen Frames	SRE, SSR
Bulkhead Fixed Screens	SRE, SSR
Bulkhead Screen Guides	SRE, SSR
Foundations	EN, SRE, SSR
Pump Intake Chambers	SCW, SRE, SSR
Reinforced Concrete: walls, floors, and ceilings	EN, MB, SNS, SRE, SSR
Roof Slabs	EN, MB, SNS, SRE, SSR
Spray pond circular header supports	SRE, SSR
Spray Pond Depressed Sump	EN, HS, SCW, SRE, SSR
Spray Pond Foundation	EN, HS, SCW, SRE, SSR
Spray Pond Sand Trap	EN, HS, SCW, SRE, SSR
Spray Pond Walls (above and below grade)	EN, HS, SCW, SRE, SSR
Standby Service Water Pump House Exterior Walls (above grade)	EN, MB, SRE, SSR
Standby Service Water Pump House Exterior Walls (below grade)	EN, SRE, SSR
Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SRE, SSR
Sumps	SNS

2.4.4 Circulating Water Pump House – Seismic Category II

Structure Description

The Circulating Water Pump House (aka Circulation Water Pump House) houses the electric and diesel driven fire water pumps, and three circulating water pumps. The Circulating Water Pump House has a reinforced concrete floor, insulated metal wall panels, and a metal roof deck over structural steel framing. The Circulating Water Pump House and the chlorination sections of the building are separated by a masonry wall. The diesel fire pump fuel storage tank room is isolated by 3-hour fire rated masonry walls.

The portion of the structure containing chlorination systems does not contain any equipment within the scope of license renewal.

Remote buildings credited in the fire protection program (Service Water Pump House 1 and 2, Circulating Water Pump House, Water Filtration Building) with non-rated barriers are sufficiently separated from each other and from the plant that a single exposure fire would not spread to more than one building.

The circulating water basin is addressed with Yard Structures (Section 2.4.12).

Reason for Scope Determination

The Circulating Water Pump House is relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48) regulated event and meets the 10 CFR 54.4(a)(3) scoping criteria. The Circulating Water Pump House provides physical support and protection to the fire water pumps, which are relied upon to demonstrate compliance with Fire Protection regulated event.

In addition, the Circulating Water Pump House is in the scope of license renewal because it contains:

- Structural components that are relied on during postulated fire event.

FSAR References

Section 10.4.5.2 and Appendix F of the FSAR describe the Circulating Water Pump House.

Components Subject to AMR

Table 2.4-4 lists the component types that require AMR and their intended functions.

The structural commodities for the Circulating Water Pump House are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-4, Aging Management Review Results - Circulating Water Pump House, provides the results of the AMR.

Table 2.4-4
Circulating Water Pump House
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Battery Racks	SRE
Bulkhead Screen Frames	SRE
Bulkhead Screen Guides	SRE
Bulkhead Screens	SRE
Foundation	SRE
Masonry Block Walls	FB, SRE
Metal Siding	SRE
Reinforced Concrete: walls, floors, and ceilings	SRE
Roof Decking	SRE
Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SRE

2.4.5 Diesel Generator Building – Seismic Category I

Structure Description

The Diesel Generator Building is a reinforced concrete diaphragm slab and shear wall type structure. It is supported on its own foundations consisting of continuous wall footings, isolated spread footing for concrete columns, and isolated equipment foundations. The ground floor is a reinforced concrete soil bearing slab. The ground floor level is divided into four rooms separated by reinforced concrete shear walls. The easterly room, in turn, is divided into three sub-compartments by concrete walls extending above the ground floor slab. A diesel oil fuel tank is horizontally buried below each of the three sub-compartments. The tanks are buried in Quality Class I backfill, which provides protection for the tanks against fire, Seismic Category I disturbances, the design basis tornado, and tornado-generated missiles. Access to these tanks is provided by means of manholes in the ground floor slab, accessible from within each of the three sub-compartments. Two diesel generators and a HPCS diesel generator engine are located on the ground floor, each in a separate room for fire protection and equipment segregation. The second level houses air handling units and the third level houses exhaust silencers.

The diesel generator units are each supported on an individual reinforced concrete foundation, isolated from the Diesel Generator Building foundations. The diesel oil storage tanks are buried, and since the groundwater level is lower than the invert of the tanks, an empty storage tank will not have buoyancy forces acting upon it.

The Diesel Generator Building, Reactor Building, Radwaste Control Building, Turbine Generator Building, and the Service Building are grouped together to form the plant complex. However, the buildings are separated from each other by gaps and are supported on separate foundation mats.

Reason for Scope Determination

The Diesel Generator Building is within the scope of license renewal as a safety-related structure, which meets the criteria of 10 CFR 54.4(a)(1). The functions of the Diesel Generator Building are to provide support and protection for equipment, and to support the ability to maintain required temperatures for operation.

The Diesel Generator Building is relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events and meets the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the Diesel Generator Building is in the scope of license renewal because it contains:

- Structural components that are safety-related and are relied upon to remain functional during and following design basis events.
- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.
- Structural components that are relied on during postulated fires, anticipated transients without scram, and station blackout events.

FSAR References

Section 3.8.4 of the FSAR describes the Diesel Generator Building.

Components Subject to AMR

Table 2.4-5 lists the component types that require AMR and their intended functions.

The structural commodities for the Diesel Generator Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-5, Aging Management Review Results - Diesel Generator Building, provides the results of the AMR.

Table 2.4-5
Diesel Generator Building
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Battery Racks	SSR
Diesel Generator Exhaust Plenums	EN, MB, SRE, SSR
Diesel Generator Intake Plenums	EN, MB, SRE, SSR
Diesel Generator Pedestals	EXP, EN, SSR
Exterior Walls (above grade)	EN, MB, SRE, SSR
Foundations	EN, EXP, SRE, SSR
Reinforced Concrete: Walls, Floors, and Ceilings	EN, FB, MB, SRE, SSR
Roof	EN, MB, SRE, SSR
Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SSR

2.4.6 Fresh Air Intake Structure No. 1 and 2 – Seismic Category I

Structure Description

Two Seismic Category I remote Fresh Air Intake Structures are provided as part of the plant control room ventilation system design. In the event of a LOCA, operating personnel within the control room are protected from airborne radioactivity by means of pressurizing the control room with filtered air drawn from either of two separate remote fresh air intakes. Both intakes are physically remote from all plant structures. The fresh air intake structures are predominantly buried structures with above grade access grating to the air intake plenum. The structures are designed to withstand the effects of Seismic Category I disturbances, design basis wind velocity, and design basis tornado and tornado-generated missiles. The bottom of the Fresh Air Intake Structures are at elevation 431 ft. msl and the top of the structures are at elevation 441 ft. 9.5 in. msl. These elevations are sufficient to protect the structures from the effects of the design basis groundwater elevation 420 ft msl and the design basis flood elevation 433.3 ft msl. The intake structures are designed to handle, with adequate drainage, the instantaneous or local intense probable maximum precipitation (PMP).

Fire external to the plant and any resulting ingress of smoke or combustion vapors is detected by smoke detectors in the control room fresh air intake ducting, which will automatically close the fire rated dampers downstream of the smoke detectors and place the control room in an unfiltered recirculation mode.

Reason for Scope Determination

The Fresh Air Intake Structure is within the scope of license renewal as a safety-related structure, which meets the criteria of 10 CFR 54.4(a)(1). The function of the Fresh Air Intake Structure, part of the main control room habitability system, is to ensure habitability inside the main control room during all normal and abnormal station operating conditions.

The function of the Fresh Air Intake Structure is to provide protection from airborne radioactivity by means of pressurizing the control room with filtered air drawn from either of two separate remote fresh air intakes in the event of a LOCA.

Fire external to the plant and any resulting ingress of smoke or combustion vapors is detected by smoke detectors in the control room fresh air intake ducting, which will automatically close the fire rated dampers downstream of the smoke detectors. Therefore, the Fresh Air Intake Structure provides support and protection for equipment used for coping with and recovery from a Fire Protection (10 CFR 50.48) regulated event and meets the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the Fresh Air Intake Structure is in the scope of license renewal because it contains:

- Structural components that are safety-related and are relied upon to remain functional during and following design basis events.
- Structural components that are relied on during postulated fire events.

FSAR References

Section 3.8.4 of the FSAR describes the Fresh Air Intake Structures.

Components Subject to AMR

Table 2.4-6 lists the component types that require AMR and their intended functions.

The structural commodities for the Fresh Air Intake Structures are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-6, Aging Management Review Results - Fresh Air Intake Structure No. 1 and 2, provides the results of the AMR.

Table 2.4-6
Fresh Air Intake Structure No. 1 and 2
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Concrete Air Plenum	EN, SSR
Exterior Walls (above grade)	EN, MB, SSR
Exterior Walls (below grade)	EN, SSR
Foundations	EN, SSR
Roof	EN, MB, SSR

2.4.7 Makeup Water Pump House (aka Tower Makeup Water Pump House) – Seismic Category II

<u>Structure Description</u>

The Makeup Water Pump House is a non-Seismic Category I structure, but is a safety-related installation designed to withstand the design basis tornado and tornado-generated missiles. The possibility of a tornado passing over the ultimate heat sink spray pond and removing a significant amount of water is considered a credible event. For this reason, the Makeup Water Pump House is designed to be tornado proof, with all piping and electrical power supply between the plant and the pump house underground with adequate soil cover to provide protection from tornado generated missiles. Two tower makeup water pumps are provided, one powered from each emergency diesel generator. Should pond water be lost due to a tornado, one of these pumps will be started to provide makeup. If the spray headers are damaged by a tornado-generated missile, cooling is provided by a feed-and-bleed mode of operation. In the feed-and-bleed mode, cooling water is supplied to the spray ponds from the Makeup Water Pump House. The Standby Service Water System takes suction from the spray ponds to provide cooling to safe shutdown equipment. The cooling water is then routed to tornado-protected underground cooling tower piping and discharged to the circulating water basin.

The Makeup Water Pump House superstructure has one main level. The superstructure is of reinforced concrete, except for miscellaneous platforms and for a portion of the operating floor located over the pump pit and pump floor areas, which are of structural steel framing floored over with steel grating.

<u>Reason for Scope Determination</u>

The Makeup Water Pump House provides structural or functional support to NSR equipment whose failure could prevent satisfactory accomplishment of required safety functions. These functions meet the scoping criteria of 10 CFR 54.4(a)(2). The function of the Makeup Water Pump House is to provide support and protection for equipment, and support the ability to maintain required temperatures for operation.

The Makeup Water Pump House provides physical support and protection to the makeup water pumps, which are required to supply water to the Spray Ponds in the event a design basis tornado empties the ponds of their coolant.

In addition, the Makeup Water Pump House is in the scope of license renewal because it contains:

- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.

FSAR References

Sections 3.8.4 and 9.2.5.3 of the FSAR describe the Makeup Water Pump House.

Components Subject to AMR

Table 2.4-7 lists the component types that require AMR and their intended functions.

The structural commodities for the Makeup Water Pump House are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-7, Aging Management Review Results - Makeup Water Pump House, provides the results of the AMR.

Table 2.4-7
Makeup Water Pump House
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Exterior Walls (above grade)	MB, SNS
Foundations	SNS
Pump Pit	SNS
Reinforced Concrete: walls, floors, and ceilings	SNS
Roof	MB, SNS
Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SNS

2.4.8 Radwaste Control Building – Seismic Category I

Structure Description

The Radwaste Control Building houses the control room, cable spreading rooms, critical switchgear room, battery room, HVAC equipment room, off gas treatment room, and the liquid and solids radwaste systems. The Radwaste Control Building houses equipment and components for both safety-related and NSR systems. Those portions of the Radwaste Control Building that house systems or components necessary for safe shutdown of the reactor are designed to Quality Class I and Seismic Category I requirements. Those portions of the Radwaste Control Building housing equipment containing radioactive material are designed to Seismic Category I requirements.

The radwaste areas and the control room area are contained in one building unit supported on a reinforced concrete mat foundation. Part of the Radwaste Control Building is a cast-in-place reinforced concrete structure and part is a structural steel-framed structure. The portions of the building that are reinforced concrete are arranged so as to form a completely enclosed boxlike structure, and are, therefore, comprised of concrete walls on four exterior sides and of top and bottom concrete slabs. The portions of the building that are structural steel framed are made up of steel-framed floors and exterior walls.

The Radwaste Control Building, Reactor Building, Turbine Generator Building, Diesel Generator Building, and the Service Building are grouped together to form the plant complex. However, the buildings are separated from each other by gaps and are supported on separate foundation mats.

Reason for Scope Determination

The Radwaste Control Building is within the scope of license renewal as a safety-related structure, which meets the criteria of 10 CFR 54.4(a)(1). The function of the Radwaste Control Building is to provide support and protection for equipment, and to support the ability to maintain required temperatures for operation. The main control room is designed to ensure habitability during all normal and abnormal station operating conditions, including 30 days of habitability following a LOCA.

The Radwaste Control Building is relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48), Anticipated Transients Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63) regulated events and meets the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the Radwaste Control Building is in the scope of license renewal because it contains:

- Structural components that are safety-related and are relied upon to remain functional during and following design basis events.

- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.
- Structural components that are relied on during postulated fires, anticipated transients without scram, and station blackout events.

FSAR References

Section 3.8.4 of the FSAR describes the Radwaste Control Building.

Components Subject to AMR

Table 2.4-8 lists the component types that require AMR and their intended functions.

The structural commodities for the Radwaste Control Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-8, Aging Management Review Results - Radwaste Control Building, provides the results of the AMR.

Table 2.4-8
Radwaste Control Building
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Battery Racks	SSR
Control Room Ceiling	SSR
Exterior Walls (above grade)	EN, MB, SHD, SRE, SSR
Foundations	EN, EXP, SRE, SSR
Masonry Block Walls	FB, SHD, SRE
Metal Siding	SNS
Partition Walls	SRE
Reinforced Concrete: walls, floors, and ceilings	EN, FB, SHD, SPB, SRE, SSR
Roof	EN, MB, SSR
Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SSR, SRE
Sump Liners	SNS
Sumps	SNS

2.4.9 Service Building – Seismic Category II

Structure Description

The Service Building is a two-story Seismic Category II structure. The only safety-related equipment in the building are two motor-operated auxiliary steam isolation valves (AS-V-68A/68B). The isolation of the auxiliary steam system is a safety-related function since it is a potential high energy line break (HELB) source to the Reactor Building that could affect the qualified life of safety-related equipment.

The Service Building, Reactor Building, Radwaste Control Building, Turbine Generator Building, and the Diesel Generator Building are grouped together to form the plant complex. However, the buildings are separated from each other by gaps and are supported on separate foundation mats.

Reason for Scope Determination

The Service Building houses safety-related components; therefore, it meets the scoping criteria of 10 CFR 54.4(a)(2).

The Service Building is a Seismic Category II structure adjacent to the Reactor Building; therefore, it meets the scoping criteria of 10 CFR 54.4(a)(2).

In addition, the Service Building is in the scope of license renewal because it contains:

- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.

FSAR References

Appendix F Section F.4.4.3 of the FSAR describes the Service Building.

Components Subject to AMR

Table 2.4-9 lists the component types that require AMR and their intended functions.

The structural commodities for the Service Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-9, Aging Management Review Results - Service Building, provides the results of the AMR.

Table 2.4-9
Service Building
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Exterior Walls (above grade)	EN, SNS
Foundations	EN, EXP, SNS
Reinforced Concrete: walls, floors, and ceilings	EN, SNS
Roof Decking	SNS
Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SNS

2.4.10 Turbine Generator Building (aka Turbine Building) – Modified Non-Seismic Category I

Structure Description

The Turbine Generator Building is a modified non-Seismic Category I structure that houses the turbine generator, condensing equipment, moisture separator re-heaters, and feedwater heaters. A 200-ton-capacity overhead crane services the Turbine Generator Building. The building structure consists of reinforced concrete from the foundation up to the operating floor level. The building structure and the turbine generator pedestal are supported on a common concrete foundation mat. Above the operating floor, the exterior walls consist of insulated metal siding supported by a structural steel frame. The roof consists of insulated metal decking covered with built-up roofing. The Turbine Generator Building foundation mat and structure are designed to withstand the effects of an SSE and maintain its structural integrity thus providing adequate protection for the main steam lines designed as Seismic Category I.

The Turbine Generator Building, Reactor Building, Radwaste Control Building, Diesel Generator Building, and the Service Building are grouped together to form the plant complex. However, the buildings are separated from each other by gaps and are supported on separate foundation mats.

Reason for Scope Determination

The Turbine Generator Building provides protection for the main steam lines designed as Seismic Category I and structural or functional support to NSR equipment whose failure could prevent satisfactory accomplishment of required safety functions. These functions meet the scoping criteria of 10 CFR 54.4(a)(2). The function of the Turbine Generator Building is to control the release of radioactivity to the environment, provide support and protection for equipment, and support the ability to maintain required temperatures for operation.

The Turbine Generator Building is a Seismic Category II structure adjacent to the Reactor Building; therefore, it meets the scoping criteria of 10 CFR 54.4(a)(2).

The Turbine Generator Building is relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48) and Station Blackout (10 CFR 50.63) regulated events and meets the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the Turbine Generator Building is in the scope of license renewal because it contains:

- Structural components that are safety-related and are relied upon to remain functional during and following design basis events.

- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.
- Structural components that are relied on during postulated fires and anticipated station blackout events.

FSAR References

Section 3.8.4 of the FSAR describes the Turbine Generator Building.

Components Subject to AMR

Table 2.4-10 lists the component types that require AMR and their intended functions.

The structural commodities for the Turbine Generator Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-10, Aging Management Review Results - Turbine Generator Building, provides the results of the AMR.

Table 2.4-10
Turbine Generator Building
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Exterior Walls (above grade)	EN, SNS, SRE
Foundations	EN, EXP, SNS, SRE
Main Steam Tunnel Extension	EN, HELB, MB, PW, SHD, SSR
Masonry Block Walls	EN, FB, SRE
Metal Siding	SRE, SNS
Reinforced Concrete: walls, floors, and ceilings	EN, FB, SNS, SRE
Roof Decking	SRE
Shield Walls	EN, MB, SHD
Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SNS, SRE
Sump Liners	SNS
Sumps	SNS
Turbine Generator Pedestals	EN, SNS, SRE

2.4.11 Water Filtration Building – Seismic Category II

Structure Description

The diesel-driven fire pump (FP-P-110) located in the Water Filtration Building delivers the secondary water supply for fire protection. The water is drawn from a 400,000-gallon embankment supported bladder tank (FP-TK-110) with a dedicated water supply of 284,640 gallons. The Water Filtration Building has a reinforced concrete floor, insulated metal wall panels, and metal roof deck over structural steel framing.

Reason for Scope Determination

The Water Filtration Building provides physical support and protection to the diesel-driven fire pump (FP-P-110), which is relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48) regulated event and meets the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the Water Filtration Building is in the scope of license renewal because it contains:

- Structural components that are relied on during postulated fires.

FSAR References

Appendix F Sections F.2.4.1 and F.2.2.13 of the FSAR describe the Water Filtration Building.

Components Subject to AMR

Table 2.4-11 lists the component types that require AMR and their intended functions.

The structural commodities for the Water Filtration Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-11, Aging Management Review Results - Water Filtration Building, provides the results of the AMR.

Table 2.4-11
Water Filtration Building
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Battery Racks	SRE
Foundations	SRE
Metal Siding	SRE
Roof Decking	SRE
Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SRE
Sumps	SRE

2.4.12 Yard Structures

Yard structures at Columbia are structures not contained within or attached to buildings such as the Reactor Building, Turbine Generator Building, Diesel Generator Buildings, or Radwaste Control Building. One exception is the Circulating Water Basin. The Circulating Water Basin is attached to the Circulating Water Pump House listed in Section 2.4.4. The Circulating Water Basin is grouped into Yard Structures to facilitate AMR by grouping the in-scope basins together. The yard structures evaluated for license renewal include foundations and structural arrangements for outside tanks, basins, station blackout components, duct banks, cable trenches, manholes, valve pits, and electrical towers. The following yard structures were determined to be within the scope of license renewal:

2.4.12.1 Circulating Water Basin – Seismic Category II

Structure Description

The circulating water basin provides impoundment of the primary source of fire water. The circulating water basin is a rectangular boxlike basin connected to the south side of the Circulating Water Pump House. The primary fire protection water supply within the fire suppression water system is at least two of the three fire suppression pumps housed at the Circulating Water Pump House, each pumping from the circulating water basin. The primary fire water supply is the Circulating Water Pump House inlet basin.

In addition, if the Spray Pond spray headers are damaged by a tornado-generated missile, cooling is provided by a feed-and-bleed mode of operation. In the feed-and-bleed mode, cooling water is supplied to the spray ponds from the Makeup Water Pump House. The Standby Service Water System takes suction from the spray ponds to provide cooling to safe shutdown equipment. The cooling water is then routed to tornado-protected underground circulating water piping and discharged to the circulating water basin.

Reason for Scope Determination

The circulating water basin provides a bleed path in the feed-and-bleed mode in the event that the Spray Pond spray headers are damaged by a tornado-generated missile; therefore, it meets the scoping criteria 10 CFR 54.4(a)(2).

The circulating water basin provides the impoundment of the primary source of fire water, which is relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48) regulated event and meets the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the circulating water basin is in the scope of license renewal because it contains:

- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.
- Structural components that are relied on during postulated fires.

2.4.12.2 Condensate Storage Tank (CST) Foundations and Retaining Area – Seismic Category I

Structure Description

A minimum inventory of 135,000 gallons in the condensate storage tanks is reserved for the RCIC and HPCS pumps. This ensures the immediate availability of a sufficient quantity of condensate for emergency core cooling and reactor shutdown. The RCIC and HPCS pumps are gravity fed from the condensate storage tanks. The condensate storage tanks are Seismic Category II; however, they are located inside a Seismic Category I concrete dike (or retention area), which is designed to retain the condensate from both tanks.

The retaining area is a reinforced concrete structure consisting of a structural slab on soil and four perimetral walls. Construction joints are keyed and continuous waterstops are provided in all horizontal joints between the slab and walls. The retention area for the tanks is designed to retain the total volume of water in the tanks if either or both rupture. The retaining area structure is designed to withstand the effects of the design basis wind and Safe Shutdown Earthquake (SSE) and is located above groundwater level.

Reason for Scope Determination

The condensate storage tank retaining area is within the scope of license renewal as a safety-related structure, which meets the criteria of 10 CFR 54.4(a)(1). The condensate storage tank retaining area for the tanks is designed to retain the total volume of water in the tanks if either or both rupture.

The condensate storage tank foundation and retaining area provides structural support to the condensate storage tank whose failure could prevent satisfactory accomplishment of required safety functions. This function meets the scoping criteria of 10 CFR 54.4(a)(2).

The Condensate Storage Tank foundation and retaining area is relied upon to demonstrate compliance with the Anticipated Transients Without Scram (10 CFR 50.62) and Station Blackout (10 CFR 50.63) regulated events and meets the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the condensate storage tank foundation and retention basin are in the scope of license renewal because they contain:

- Structural components that are safety-related and are relied upon to remain functional during and following design basis events.
- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.
- Structural components that are relied on during anticipated transients without scram and station blackout events.

2.4.12.3 Cooling Tower Basins – Seismic Category II

Structure Description

Six Seismic Category II circular mechanical-induced draft cooling towers have the capacity to cool plant service water during normal operation and standby service water during shutdown operation. The operation of the towers is not essential to the safety of the plant. The cooling towers are located such that there can be no physical interaction between them and plant structures important to safety in the unlikely event of a tower collapse.

If the spray pond spray headers are damaged by a tornado-generated missile, cooling is provided by a feed-and-bleed mode of operation. In the feed-and-bleed mode, cooling water is supplied to the Spray Ponds from the Makeup Water Pump House. The SSW System takes suction from the Spray Ponds to provide cooling to safe shutdown equipment. The cooling water is then routed to tornado-protected underground circulating water piping and discharged to the circulating water basin. The cooling tower basins are within the path of the feed-and-bleed mode.

The cooling towers are not within the scope of license renewal, but the cooling tower basins are within license renewal scope since they are part of the bleed path in the feed-and-bleed mode in the event that the Spray Pond spray headers are damaged by a tornado-generated missile.

Reason for Scope Determination

The cooling tower basins provide a bleed path in the feed-and-bleed mode in the event that the Spray Pond spray headers are damaged by a tornado-generated missile, therefore, they meet the scoping criteria of 10 CFR 54.4(a)(2).

In addition, the cooling tower basins are in the scope of license renewal because they contain:

- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.

2.4.12.4 Diesel Fuel Polishing Building – Seismic Category II

Structure Description

The NSR diesel fuel polishing building houses the diesel filter polisher skid. The building is a commercial grade steel framed building installed on a concrete slab at grade located in the yard.

The Diesel Fuel Oil (DO) System contains NSR piping, anchored by the filter polisher skid (DO-FP-1), that is directly connected to safety-related piping. The connected sections of piping are buried underground, with the NSR piping passing through a concrete pad before becoming exposed at the filter polisher skid. For NSR components connected to safety-related components, the NSR components and their supports, up to and including the first equivalent anchor (or attachment to a major component) are within the scope of license renewal. However, failure of the above-ground portion of the attached NSR piping would not prevent the DO System from providing fuel oil to the emergency diesel generators. The exposed portion of NSR piping is at a higher elevation than the fuel oil tanks thus preventing leakage from the tanks. Failure of the above-ground portion of the NSR piping will not transmit forces to the fuel oil tanks that would prevent the DO System from fulfilling its intended function. Therefore, the above-ground portion of the attached NSR piping, up to and including the filter polisher skid, is not subject to AMR.

The diesel fuel polishing building is within license renewal scope, but is not subject to AMR because the failure of the NSR components within the building would not prevent the DO System from fulfilling its intended function.

Reason for Scope Determination

The diesel fuel polishing building provides support and protection for the filter polisher skid (DO-FP-1). The filter polisher skid is an anchor for the NSR piping that is directly connected to safety-related piping in the DO System. Therefore, the structure meets the scoping criteria of 10 CFR 54.4(a)(2).

2.4.12.5 Fire Water Bladder Tank (FP-TK-110) Embankment – Seismic Category II

Structure Description

The secondary source of fire water supply is drawn from a 400,000-gallon embankment supported bladder tank (FP-TK-110) with a dedicated water supply of 284,640 gallons. The fire water bladder tank embankment supports the fire water bladder tank. The water supply is delivered to the fire water main loop by a diesel-driven fire pump (FP-P-110) located in the Water Filtration Building.

Reason for Scope Determination

The fire water bladder tank embankment provides support and protection to the fire water bladder tank, which is relied upon to demonstrate compliance with the Fire

Protection (10 CFR 50.48) regulated event and meets the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the fire water bladder tank embankment is in the scope of license renewal because it contains:

- Structural components that are relied on during postulated fires.

2.4.12.6 Hydrogen Storage and Supply Facility (HSSF) – Modified Non-Seismic Category I

Structure Description

The hydrogen storage and supply facility (HSSF) is part of a hydrogen water chemistry system to prevent and mitigate intergranular stress corrosion cracking in reactor internal structures and piping welds. The facility consists of a fenced gravel yard with concrete pads constructed to accommodate a liquid hydrogen tank, nitrogen tank, gaseous hydrogen storage tubes, and all supporting piping and equipment necessary to supply the station with gaseous hydrogen.

The HSSF liquid hydrogen storage tank, foundations, anchorage (i.e., anchor bolts, slide plates, and the baseplate welding) and the underlying soil are not safety-related, and are designated as Quality Class II+. However, these are designed for Seismic Category I loads and ground motion as defined by Regulatory Guide 1.60. In addition, they were designed to remain in place for both design basis tornado characteristics and maximum probable flood.

The only components within the scope of license renewal are the HSSF liquid hydrogen storage tank foundations and anchorage.

Reason for Scope Determination

The HSSF liquid hydrogen storage tank, foundation, anchorage are designed to remain in place for both design basis tornado characteristics and maximum probable flood; therefore, they meet the scoping criteria of 10 CFR 54.4(a)(2).

In addition, the HSSF is in the scope of license renewal because it contains:

- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.

2.4.12.7 Mobile Fire Response Vehicle and Trailer – Seismic Category II

Structure Description

A mobile fire response vehicle and trailer is equipped with the equivalent of three hose houses and provides sufficient hose so that a single fire at any plant location can be reached by an effective hose stream. A combination fog shut-off type hose nozzle is also provided in the trailer. At least once per six months, all required hydrant equipment staged on the mobile fire response vehicle and trailer is verified.

The fire equipment trailer is located within Building 62 (the Primary Access Point). The stored equipment is verified as staged once per six months and existing hoses are replaced with a hose that has satisfactorily passed a hose hydrostatic test at least once per year. The mobile fire response vehicle and trailer is required to be operable at all times and compensatory actions are taken when the mobile response trailer is inoperable or outside the protected area.

The mobile fire response vehicle and trailer is within license renewal scope, but is screened out for AMR because the mobile fire response vehicle is active and the stored equipment in the trailer has a set inspection and replacement frequency.

Reason for Scope Determination

The mobile fire response vehicle and trailer provide fire fighting equipment storage for the equivalent of three hose houses that are relied upon during a Fire Protection (10 CFR 50.48) regulated event and therefore meet the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the mobile fire response vehicle and trailer are in the scope of license renewal because they contain:

- Structural components that are relied on during postulated fires.

2.4.12.8 Station Blackout Component Foundations and Structures in the Yard (Startup Transformers TR-S, Backup Transformer TR-B, Ashe A809 Breaker, Oil Circuit Breaker (OCB) E-CB-TRB, and Ashe Relay House) – Seismic Category II

Structure Description

The power sources supplied to the plant via startup transformer TR-S and backup transformer TR-B provide the station blackout recovery path from the offsite power system.

The 230-kV boundary point for the station blackout license renewal boundary is the Ashe A809 breaker located within the Ashe switchyard approximately 0.5 miles from the Columbia transformer yard. The 230-kV power source consists of the tie line from the Ashe substation through the 230-kV Ashe to Columbia feeder breaker A809 to the Columbia startup transformer TR-S. The Ashe substation is located within the security perimeter within the Columbia exclusion area. All transmission line towers, substation busses, and connections are similarly located. The Ashe substation is operated by the Bonneville Power Administration (BPA) as part of its transmission system. Startup transformer TR-S is located in a separate transformer yard within the plant security fence.

The 115-kV BPA tie line is from the BPA 115-kV Hanford loop through a maintenance disconnect switch at the 115-kV oil circuit breaker (OCB) E-CB-TRB. The output of the OCB is directly tied to the 115-kV/4.16-kV backup transformer TR-B. All of the equipment needed to connect to the primary offsite circuit is located within plant buildings, the transformer yard, or within the Ashe substation. All equipment needed to connect to the backup offsite circuit is located within plant buildings or the transformer yard.

The TR-S and TR-B transformers are protected by transformer mounted instrument or protective relays located in the plant switchgear areas. The transformers and associated disconnect switch are supported by reinforced concrete pads.

The Ashe relay house is a single story structure that houses the batteries and controls associated with the Ashe A809 breaker. The Ashe relay house is operated by the Bonneville Power Administration as part of its transmission system.

Reason for Scope Determination

The function of the station blackout component foundations and structures is to provide physical support for transformers and associated breakers, disconnect switches, controls, and batteries (foundations, support structures, electrical towers), which are relied upon to demonstrate compliance with the Station Blackout (10 CFR 50.63) regulated event and therefore meet the 10 CFR 54.4(a)(3) scoping criteria.

In addition, station blackout component foundations and structures are in the scope of license renewal because they contain:

- Structural components that are relied on during station blackout events.

2.4.12.9 Duct Banks, Cable Trenches, Manholes, Valve Pits, and Electrical Towers – Seismic Categories I and II

Structure Description

Duct banks, cable trenches, manholes, and valve pits are installed and routed in the yard to provide physical support and shelter for in-scope mechanical components such as piping and valves and in-scope electrical components such as electric cables and conduits. Electrical towers or transmission towers are provided to support overhead electric cables.

Structural fill, as required, is utilized below the other Seismic Category I and safety-related structures including underground piping and electrical duct banks. The structural fill is compacted to a minimum of 75 percent relative density and an average relative density of not less than 85 percent. The compacted backfill will eliminate the possibility of liquefaction and provide satisfactory foundation performance should the groundwater level at the Columbia Generating Station site rise.

Reason for Scope Determination

Duct banks, cable trenches, manholes, valve pits, and electrical towers located in the yard are structural component groups not uniquely identified as a structure or building. They provide physical support and shelter to safety-related equipment and therefore meet the criteria of 10 CFR 54.4(a)(1).

Duct banks, cable trenches, manholes, valve pits, and electrical towers located in the yard provide physical support and shelter to NSR equipment whose failure could prevent satisfactory accomplishment of required safety functions; therefore, they meet the scoping criteria of 10 CFR 54.4(a)(2).

Duct banks, cable trenches, manholes, valve pits, and electrical towers located in the yard provide physical support and shelter to equipment relied upon to demonstrate compliance with the Station Blackout (10 CFR 50.63) regulated event and therefore meet the 10 CFR 54.4(a)(3) scoping criteria.

In addition, the duct banks, cable trenches, manholes, valve pits, and electrical towers located in the yard are in the scope of license renewal because they contain:

- Structural components that are safety-related and are relied upon to remain functional during and following design basis events.
- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.
- Structural components that are relied on during station blackout events.

FSAR References

Section 9.2.5.3 and Appendix F Section F.5.2.1 of the FSAR describe the circulating water basin. The structural details of the foundation are not described.

Sections 3.8.4.1.7, 9.2.6.2, and 9.2.6.3 of the FSAR describe the condensate storage tank and the retention basin.

Sections 9.2.5.3 and 10.4.5 of the FSAR describe the cooling towers. The structural details of the cooling tower basin are not described.

Section 9.5.4.1.d of the FSAR discusses the diesel fuel polishing building. The structural details of the building are not described.

Appendix F Section F.2.4.1 of the FSAR describes the fire water bladder tank. The structural details of the fire water bladder tank earthen embankment are not described.

Table 3.2-1 Note 35 of the FSAR describes the design requirement of the HSSF liquid hydrogen storage tank, foundations, anchorage. The structural details of the HSSF liquid hydrogen storage tank foundations and anchorage are not described.

Appendix F Sections F.2.5.2, F.5.6.2, and F.5.6.3 of the FSAR describe the mobile fire response vehicle and trailer. The structural details of the fire response trailer are not described.

The structural details of the station blackout component foundations and structures are not described in the FSAR.

Section 3.4.1.4.2 of the FSAR describes the structural compact fill at Columbia. The structural details of the duct banks, manholes, valve vaults, instrument pits, and piping trenches are not described in the FSAR.

Components Subject to AMR

Table 2.4-12 lists the component types that require AMR and their intended functions.

Field erected tanks are evaluated in Section 2.3 as mechanical components within their corresponding system. The structural commodities for the yard structures are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-12, Aging Management Review Results - Yard Structures, provides the results of the AMR.

**Table 2.4-12
Yard Structures
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Ashe Relay House Foundation	SRE
Ashe Relay House Metal Siding	SRE
Ashe Relay House Roof Decking	SRE
Ashe Relay House Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SRE
Circulating Water Basin	SNS, SRE
Condensate Storage Tank Foundation (ring wall)	SNS, SRE
Condensate Storage Tank Retaining Area (slab)	FLB, SRE, SSR
Condensate Storage Tank Retaining Area (walls)	FLB, SRE, SSR
Cooling Tower Basins	SNS
Duct banks	EN, SNS, SRE, SSR
Fire Water Bladder Tank (FP-TK-110) Embankment Apron	SRE
Fire Water Bladder Tank (FP-TK-110) Embankment	SRE
Fire Water Bladder Tank (FP-TK-110) Support Pads	SRE
Fire Water Bladder Tank (FP-TK-110) Vent Line Enclosure	SRE
HSSF Liquid Hydrogen Storage Tank Foundation (raised pedestals)	SNS
HSSF Liquid Hydrogen Storage Tank Foundation (slab)	SNS
Manhole Covers	EN, SNS, SRE, SSR
Manholes	EN, SNS, SRE, SSR
Thrust Blocks	SRE
Transformer and Breaker Foundations (SBO)	SRE
Transmission Tower Foundations	SRE
Transmission Towers	SRE
Weir Box (circulating water basin)	SRE

2.4.13 Bulk Commodities

Structure Description

Bulk commodities are structural component groups that support in-scope structures, and mechanical and electrical systems (e.g., anchorages, embedments, instrument panels, racks, cable trays, conduits, fire seals, fire doors, hatches, monorails, equipment and component supports). They are common to multiple SSCs and share material and environment properties that allow a common program or inspection to manage their aging effects.

Reason for Scope Determination

Bulk commodities are in scope based on the equipment that they support or protect.

Bulk commodities that support or protect safety-related equipment meet the criteria of 10 CFR 54.4(a)(1).

Bulk commodities that support or protect NSR equipment meet the criteria of 10 CFR 54.4(a)(2).

Bulk commodities that support or protect equipment are relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48), Anticipated Transients Without Scram (10 CFR 50.62), or Station Blackout (10 CFR 50.63) regulated events and meet the 10 CFR 54.4(a)(3) scoping criteria.

In addition, bulk commodities are in the scope of license renewal because they contain:

- Structural components that are safety-related and are relied upon to remain functional during and following design basis events.
- Structural components that are NSR whose failure could prevent satisfactory accomplishment of safety-related functions.
- Structural components that are relied on during postulated fires, anticipated transients without scram, and station blackout events.

FSAR References

The FSAR contains numerous mentions of these commodities, but does not specifically discuss or describe commodities.

Components Subject to AMR

Table 2.4-13 lists the component types that require AMR and their intended functions.

Table 3.5.2-13, Aging Management Review Results - Bulk Commodities, provides the results of the AMR.

Table 2.4-13
Bulk Commodities
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Steel and Other Metals	
Anchorage / Embedments	SNS, SRE, SSR
Cable Tie Wraps	SNS, SRE, SSR
Cable Tray and Conduit Supports	SNS, SRE, SSR
Cable Trays and Conduits	EN, FB, SNS, SRE, SSR
Component and Piping Supports (ASME Class 1, 2, 3, and MC)	SRE, SSR
Damper Framing (in-wall)	SNS, SRE, SSR
Electrical and Instrument Panels and Enclosures	EN, SNS, SRE, SSR
Electrical Bus Ducts	EN, SRE, SSR
Equipment Component Supports	SNS, SRE, SSR
Flood Curbs	FLB, SNS
Flood, Pressure, and Specialty Doors	FLB, MB, PB, SHD, SNS, SRE, SSR
Hatches	EN, FB, FLB, MB, PB, SNS, SRE, SSR
HELB Barriers (includes pipe restraints, whip restraints, and jet and missile impingement shield and plate barriers)	HELB, PW, SNS, SSR
HVAC Duct Supports	SNS, SRE, SSR
Instrument Line Supports	SNS, SRE, SSR
Instrument Racks and Frames	SNS, SRE, SSR
Monorails, Hoists, and Miscellaneous Cranes	SNS
Penetrations (mechanical and electrical, non primary containment boundary)	EN, FB, FLB, PB, SNS, SRE, SSR
Pipe Supports	SNS, SRE, SSR

Table 2.4-13: Bulk Commodities (continued)	
Component Type	**Intended Function (as defined in Table 2.0-1)**
Stair, Ladder, Platform, and Grating Supports	SNS, SRE
Stairs, Ladders, Platforms, and Gratings	SNS, SRE
Tube Track Supports	SNS, SRE, SSR
Tube Tracks	SNS, SRE, SSR
Vents and Louvers	SNS, SRE, SSR
Threaded Fasteners	
Anchor Bolts	SNS, SRE, SSR
Anchor Bolts (ASME Class 1, 2, 3, and MC Supports Bolting)	SRE, SSR
Expansion Anchors	SNS, SRE, SSR
Concrete Components	
Equipment Pads	SNS, SRE, SSR
Flood Curbs	FLB, SNS
Floor Trenches	SNS, SRE, SSR
Hatches	EN, FB, FLB, MB, PB, SHD, SNS, SRE, SSR
Support Pedestals	SNS, SRE, SSR
Elastomeric Components	
Biological Shield Wall Annulus Compressible Material (Note: component evaluated under bulk commodities due to material construction)	EXP, SSR
Building Pressure Boundary Seals and Sealants	EXP, PB, SNS, SSR
Compressible Joints and Seals	EXP, FLB, SNS, SSR
Expansion Boots	EXP, FLB, SNS, SRE, SSR
Roof Membrane	EN, FLB, SNS, SRE, SSR
Waterproofing Membrane	FLB, SNS, SSR
Waterstops	FLB, SNS, SSR

Table 2.4-13: Bulk Commodities (continued)	
Component Type	**Intended Function (as defined in Table 2.0-1)**
Fire Barrier Commodities Note: Masonry and concrete fire barriers, such as walls, ceilings, and floors, are evaluated under the "Masonry Block Walls" and "Reinforced Concrete: walls, floors, and ceilings" component groups with the respective structure.	
Fire Doors	FB, SNS, SRE, SSR
Fire Stops	FB, FLB, PB, SNS, SRE, SSR
Fireproofing	FB, SNS, SRE, SSR
Fire Wraps	FB, SNS, SRE, SSR
Fluoropolymers and Lubrite Sliding Surfaces	
Cable Tie Wraps	SNS, SRE, SSR
Lubrite sliding supports	SNS, SSR
Miscellaneous Materials	
Containment Penetration Insulation (Note: component evaluated under bulk commodities due to material construction)	SNS
Piping and Mechanical Equipment Insulation	SNS

2.5 SCOPING AND SCREENING RESULTS: ELECTRICAL AND INSTRUMENTATION AND CONTROL SYSTEMS

The determination of electrical and I&C systems within the scope of license renewal is made through the application of the process described in Section 2.1. The results of the electrical and I&C systems scoping review are contained in Section 2.2.

Section 2.1 also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The components that meet these screening requirements are identified in this section. These identified components consequently require an AMR for license renewal.

Components that support or interface with electrical and I&C components, for example, instrument racks, panels, cabinets, cable trays, conduit, and their supports, are included in the civil-structural assessment documented in Section 2.4.

Information on the Columbia electrical and I&C systems can be found in FSAR Chapter 7 for the I&C systems, FSAR Chapter 8 for the electrical power systems, and FSAR Section 8.2 in particular for the station offsite power system. Appendix F of the FSAR provides requirements regarding fire protection for electrical and I&C components. Chapter 3 of the FSAR provides requirements regarding environmental qualification for electrical and I&C components.

2.5.1 Electrical and I&C Screening Process

The screening process identifies the electrical component commodity groups that are subject to AMR (for in-scope plant systems including electrical and I&C components). This identification is performed by following the requirements of 10 CFR 54.21(a) and the guidance of NEI 95-10, Appendix B. Electrical components that are active and electrical components that are replaced on a specified time schedule are excluded. Only long-lived and passive components that perform a license renewal intended function are subject to AMR.

2.5.2 Application of Screening Criteria 10 CFR 54.21(a)(1)(i) to Electrical and I&C Component Commodity Groups

The screening determination with respect to the passive criterion is taken directly from NEI 95-10. It is important to note that the definitions of active and passive with respect to license renewal may not correspond to the definitions typically used for these terms in nuclear power plants. The license renewal definitions for active and passive are found in the Statements of Consideration for 10 CFR 54 and in NEI 95-10.

Appendix B of NEI 95-10 delineates which commodity groups are active and which are passive. The active components are excluded from further review, by the direction of 10 CFR 54.21(a)(1)(i).

Table 2.5.2-1 provides a listing of the industry "standard" passive electrical component commodity groups (and their generic intended functions). In the performance of the screening review, these commodity groups were taken as the base case. Specific Columbia documents were reviewed to determine the applicability of the industry standard commodity groups (i.e., single-line drawings, maintenance rule functions, Chapter 7 and Chapter 8 and Appendix F of the FSAR, electrical layout drawings, etc.). The screening review also evaluated the environmental qualification status of the electrical and I&C components. For Columbia, the screening review did not identify any additional commodity groups for evaluation – the list in Table 2.5.2-1 is complete.

In addition to the 'standard' passive electrical commodity groups in Table 2.5.2-1, cable tie-wraps are addressed for Columbia (as a structural item) in Section 2.4.13.

Table 2.5.2-1
Industry Standard List of Passive Electrical Commodities

<table>
<tr><th>Passive Electrical Commodities</th><th>Intended Function</th></tr>
<tr><td>Insulated Cables and Connections -
(e.g., power, instrumentation, control, fiber optic cables, communication applications; connections include connectors, splices, terminal blocks, and fuse holders)</td><td rowspan="3">Conduct electricity –
Provide electrical connection to specified portions of an electrical circuit to deliver voltage, current, or signals</td></tr>
<tr><td>Electrical Portions of Electrical and I&C Penetration Assemblies</td></tr>
<tr><td>Metal Enclosed Bus -
(e.g., iso-phase bus, non-segregated phase bus, segregated phase bus, and bus duct)</td></tr>
<tr><td>Switchyard Bus and Connections</td><td rowspan="3">Conduct electricity</td></tr>
<tr><td>Transmission Conductors and Connections</td></tr>
<tr><td>Uninsulated Ground Conductors and Connections</td></tr>
<tr><td>High-voltage Insulators -
(e.g., porcelain switchyard insulators, transmission line insulators)</td><td>Insulation (and support)</td></tr>
</table>

2.5.3 Elimination of Component Commodity Groups with no License Renewal Intended Functions

No generic electrical and I&C component commodity groups were eliminated from AMR at Columbia, in accordance with the direction of 10 CFR 54.21(a)(1)(i) regarding license renewal intended functions. However, individual components within a component and commodity group may still be eliminated from AMR based on this criteria.

2.5.4 Application of Screening Criteria 10 CFR 54.21(a)(1)(ii) to Electrical and I&C Component Commodity Groups

The next step in the electrical screening process is to segregate the “long-lived” electrical components from those that are subject to replacement based on a qualified life or a specified time schedule. In general, components that are screened out of license renewal consideration based on the “long-lived” criterion are those included in the plant environmental qualification (EQ) program. Electrical components included in the plant EQ program have qualified lives and are replaced based on their qualified life determination. Therefore, environmentally qualified components do not meet the “long-lived” criterion of 10 CFR 54.21(a)(1)(ii) and are excluded from further evaluation. EQ evaluations that meet the criteria for a time-limited aging analysis are addressed in Section 4.4.

2.5.4.1 Electrical Portions of Electrical and I&C Penetration Assemblies

The electrical penetration assembly commodity group is excluded from AMR because all of the Columbia electrical penetrations are part of the EQ program. The electrical penetration assemblies are addressed by various EQ analyses. Therefore, the electrical penetration assemblies are not subject to AMR at Columbia, because they do not meet the long-lived criterion of 10 CFR 54.21(a)(1)(ii).

2.5.4.2 Insulated Cables and Connections in the EQ Program

The insulated cables and connections that are included in the plant EQ program have qualified lives and are replaced based on their qualified life determination. Therefore, insulated cables and connections that are included in the EQ program do not meet the “long-lived” criterion of 10 CFR 54.21(a)(1)(ii) and are not subject to AMR.

2.5.5 Electrical and I&C Component Commodity Groups Requiring an Aging Management Review

The electrical and I&C component commodity groups that require AMR are listed in Table 2.5-1, along with their intended functions. Intended functions are defined in Table 2.0-1.

Table 3.6.2-1, Aging Management Review Results - Electrical and I&C Components, provides the results of the AMR.

Each of the electrical and I&C component commodity groups that require an AMR is discussed in the following sections.

2.5.5.1 Non-Environmentally Qualified Insulated Cables and Connections

The non-environmentally qualified insulated cables and connections commodity group includes all in-scope electric power cables, control cables, and instrumentation cables that are not addressed by the EQ program, and those in-scope connections (splices, terminal blocks, fuse holders, and electrical connectors) that are not addressed by the EQ program. Also included in this group are the metallic parts of electrical cable connections (typically bolted connections).

An insulated cable is an assembly consisting of one or more conductors (aluminum or copper) with a covering of insulation, and may include fillers and a jacket to cover the entire assembly. The assembly may also include a metallic shield. The jacket, filler, and metallic shield are not evaluated for the purposes of license renewal; the insulation is the only portion subject to evaluation.

Cable connectors are used to connect the cable conductors with other cables or with a variety of electrical devices (e.g., motors or instruments). Examples of connectors are compression fittings, fusion connectors, plug-in connectors, and terminal blocks (including fuse blocks).

Splices are used to connect cable conductors to penetration pigtails or to motor leads, and are also used to connect sections of cable during repair or replacement. Splices may also have been utilized during original cable installation (e.g., for long runs of cable).

A terminal block consists of an insulating base with fixed metallic points for landing wires (conductors) or for connecting terminal rings (lugs). Terminal blocks are installed in an enclosure such as a panel, control board, motor control center, terminal box, or junction box.

Fuse holders consist of an insulating base with fixed metallic clamps for holding each end of the fuse. The clamps can be spring-loaded clips that allow the fuse ferrules or blades to slip in, or they can be bolt lugs, to which the fuse ends are bolted.

The function of insulated cables and connections is to provide electrical connection to specified portions of an electrical circuit to deliver voltage, current, or signals. Non-environmentally qualified insulated cables and connections are passive, long-lived components. Therefore, non-environmentally qualified insulated cables and connections meet the criteria of 10 CFR 54.21(a)(1) and are subject to an AMR.

2.5.5.2 Metal-Enclosed Bus

Metal-enclosed bus connects two or more elements of an electric power circuit and is used to connect active electrical components such as switchgear, transformers, and switches.

The metal-enclosed bus within the Columbia license renewal scope is the non-segregated phase bus associated with startup transformer E-TR-S, found in the 6.9 kV electrical system (E-BUS-NONSEG/S/X) and also in the 4.16 kV electrical system (E-BUS-NONSEG/S/Y). The in-scope metal-enclosed bus is of a rigid metallic construction, with flexible link attachments at the bus-to-switchgear connections. The license renewal evaluation of the non-segregated metal-enclosed bus includes only the bus sections between active electrical components. The distribution bus and the connections inside the enclosures of active components are inspected and maintained as part of the active components, and are therefore excluded from AMR.

The 6.9 kV and 4.16 kV non-segregated phase bus associated with the unit normal auxiliary transformers and the 25 kV iso-phase bus are not within the scope of license renewal. These metal-enclosed buses are excluded from the license renewal review because back-feed through the main transformers is not credited for station blackout recovery at Columbia, and these components do not perform any other license renewal function. There is no segregated metal-enclosed bus at Columbia.

The non-segregated phase metal-enclosed bus is enclosed within its own passive enclosure and is not part of an active component, such as switchgear, a load center, or a motor control center. Non-segregated phase bus (evaluated as metal-enclosed bus for license renewal) is electrical bus constructed with all phase conductors in a common metal enclosure without barriers (i.e., with only an air space) between the phases. The bus assembly is comprised of two parts: the portion associated with the electrical conductor (the bus bar and its connections) and the portion associated with the bus enclosure and supports. The bus enclosure and support assembly is evaluated as a structural commodity (see Section 2.4.13). The gaskets (elastomers) in the enclosure assembly (at the enclosure joints) are also listed as a structural commodity.

The function of a non-segregated metal-enclosed bus is to provide electrical connection to specified portions of an electrical circuit to deliver voltage and current. The internal bus supports also provide insulation. Non-segregated metal-enclosed bus is a passive, long-lived component. Therefore, non-segregated metal-enclosed bus meets the criteria of 10 CFR 54.21(a)(1) and is subject to AMR.

2.5.5.3 Switchyard Bus and Connections

Switchyard bus is uninsulated, unenclosed, rigid electrical conductor used in plant switchyards and switching stations to connect two or more elements of an electrical power circuit. The switchyard bus which connects backup transformer E-TR-B to circuit breaker E-CB-TRB, and the switchyard bus between the 230 kV overhead line and circuit breaker A809, are within the scope of license renewal for Columbia. The switchyard bus connections associated with these portions of bus are also in the license renewal scope.

The switchyard bus is connected to flexible connectors that are supported by insulators and ultimately by structural components such as concrete footings and structural steel.

The function of the switchyard bus and connections is to provide electrical connection to specified portions of an electrical circuit to deliver voltage and current. Switchyard bus and connections are passive, long-lived components. Therefore, the switchyard bus and connections meet the criteria of 10 CFR 54.21(a)(1) and are subject to an AMR.

2.5.5.4 Transmission Conductors and Connections

Transmission conductors are category ACSR (aluminum conductor steel reinforced), stranded aluminum conductors wrapped around a steel core. They are uninsulated, high-voltage conductors used to carry loads in plant switchyards and in distribution applications. The connections are cast aluminum or galvanized steel, with stainless steel washers.

The section of transmission conductor at Columbia within the scope of license renewal is located between the start-up transformer E-TR-S and the Ashe substation (to breaker A809, the license renewal boundary for the 230-kV system). This section of transmission conductor is approximately 0.5 miles long and is supported by five electrical towers (including the two dead end towers) between the transformer yard and the Ashe substation.

The function of transmission conductors and connections is to provide electrical connection to specified portions of an electrical circuit to deliver voltage and current. Transmission conductors and connections are passive, long-lived components. Therefore, the transmission conductors and connections meet the criteria of 10 CFR 54.21(a)(1) and are subject to an AMR.

2.5.5.5 Uninsulated Ground Conductors and Connections

Uninsulated ground conductors are electrical conductors (copper cable, copper bar) that are uninsulated and are used to make ground connections to electrical equipment. Uninsulated ground conductors are connected to electrical equipment housings and electrical enclosures as well as to metal structures such as the cable tray system and building structural steel. Uninsulated ground conductors and connections are isolated or insulated from the electrical operating circuits. Uninsulated ground conductors enhance the capability of the electrical system to withstand electrical system disturbances (e.g., electrical faults or lightning) for electrical components and for personnel protection.

The plant grounding grid and the associated masts, lightning rods, and steel towers are credited with providing protection against lightning-induced fires, as indicated in FSAR Table F.3-1 paragraph A.4. The Reactor Building and the vent stacks are provided with a lightning protection system (the masts). The Turbine Building has metal wall panels directly grounded to the structural steel, which is connected to the grounding grid. The height of the Reactor Building provides a zone of protection for the Diesel Generator Building and the safety-related portions of the Radwaste Control Building. In addition, the plant grounding grid is credited for facilitating the operation of ground fault detection devices in the event of a ground fault or insulation failure on any electrical load or current, as indicated in FSAR Section 8.3.1.1.9.18. Therefore, the uninsulated ground conductors and connections are included in the scope of license renewal.

The function of the uninsulated ground conductors and connections is to provide a path to deliver lightning-induced voltage and current to the ground grid or to provide an electrical system fault current return path to the ground grid. Uninsulated ground conductors and connections are passive, long-lived components. Therefore, the uninsulated ground conductors and connections meet the criteria of 10 CFR 54.21(a)(1) and are subject to an AMR.

2.5.5.6 High-Voltage Insulators

A high-voltage insulator is a component uniquely designed to physically support a high-voltage conductor and to separate the conductor electrically from another conductor or object. The high-voltage insulators evaluated for license renewal at Columbia include those associated with start-up transformer TR-S, back-up transformer TR-B, and circuit breaker E-CB-TRB. The high-voltage insulators associated with the 230-kV transmission line to the Ashe substation are also included in this commodity group (and also the 230-kV station post insulators inside the Ashe substation).

There are two basic types of insulators: station post insulators, and strain (or suspension) insulators. Station post insulators are large and rigid and are used to support stationary equipment, such as short lengths of transmission conductors, switchyard bus, and disconnect switches. Strain insulators are used in applications where movement of the supported conductor is expected and allowed, including maintaining tensional support of transmission conductors between transmission towers or other supporting structures.

Station post insulators are used for the short length of switchyard bus connecting back-up transformer E-TR-B to circuit breaker E-CB-TRB and for the switchyard bus connecting circuit breaker E-CB-TRS to the 230-kV line from start-up transformer E-TR-S. Strain insulators are used for the 230-kV line from start-up transformer E-TR-S to the Ashe substation.

The function of high-voltage insulators is to insulate and support an electrical conductor. High voltage insulators are passive, long-lived components. Therefore, high voltage insulators meet the criteria of 10 CFR 54.21(a)(1) and are subject to an AMR.

2.5.6 Evaluation Boundaries

2.5.6.1 System Evaluation Boundaries

The evaluation boundaries for the electrical and I&C systems within the scope of license renewal include the entire system. Electrical and I&C component types within the boundaries of in-scope mechanical systems are also included within the electrical and I&C evaluation boundaries.

2.5.6.2 Station Blackout Evaluation Boundaries

The License Renewal Rule, 10 CFR 54.4(a)(3), requires that plant SSCs relied on for compliance with the NRC regulation on station blackout (SBO), 10 CFR 50.63, be included in the scope of license renewal. In April 2002, the NRC issued additional guidance on the (license renewal) scoping of equipment relied on to meet the requirements of 10 CFR 50.63 in the form of an Interim Staff Guidance document (ISG-02). Subsequently, this guidance was incorporated into NUREG-1801, Revision 1.

Using the requirements of the License Renewal Rule, the guidance provided in NUREG-1800, the insights of ISG-02, and the current licensing basis documentation, the SBO license renewal scoping boundary was established and the in-scope SSCs for SBO were identified. The following paragraphs describe the SBO license renewal off-site power recovery paths for Columbia.

Two independent offsite power sources are supplied to Columbia via start-up transformer E-TR-S and back-up transformer E-TR-B.

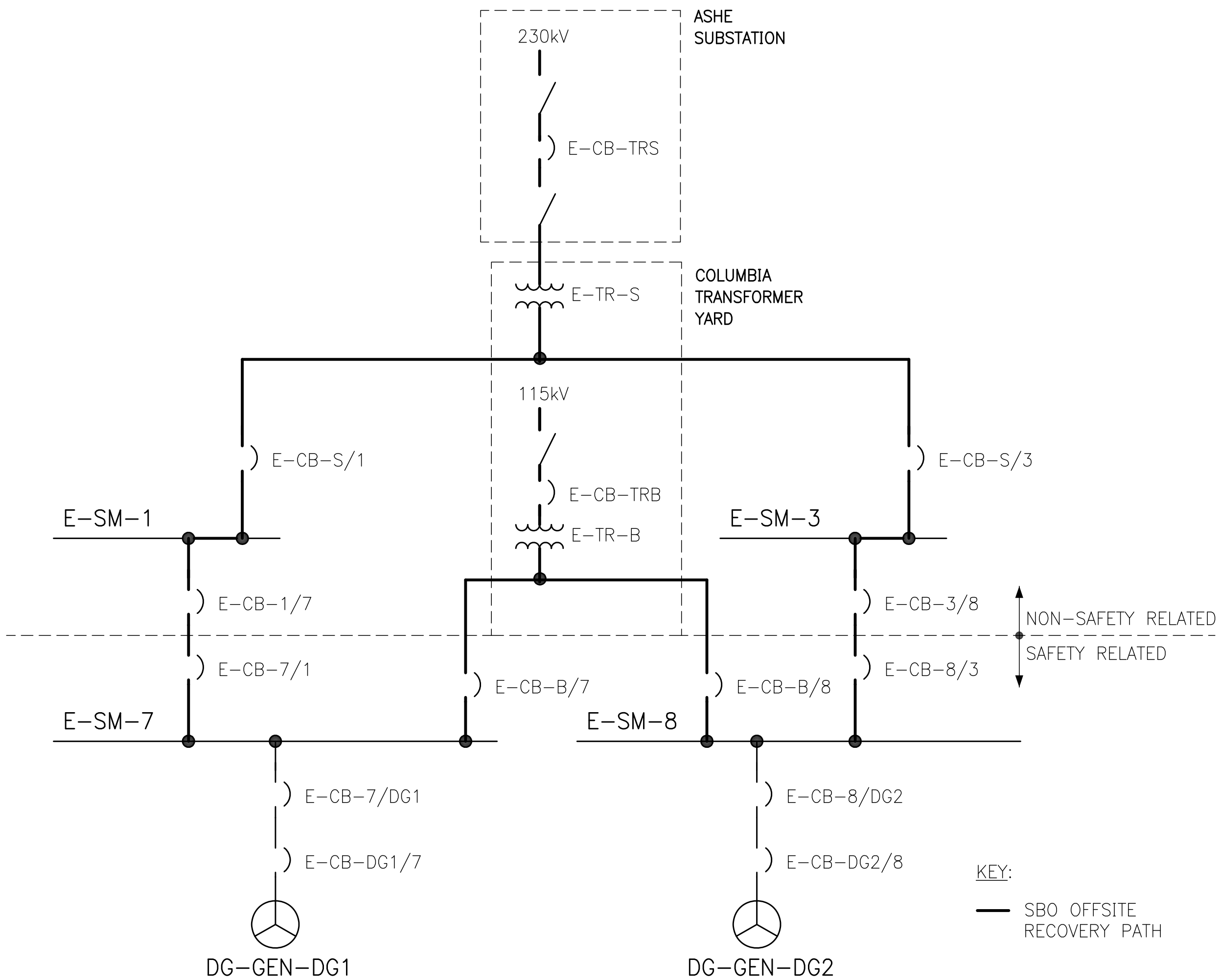
The 230-kV grid is connected to the onsite power system by breaker E-CB-TRS (also known as A809) at the Ashe substation then via overhead line to transformer E-TR-S located in the Columbia transformer yard. The distribution from the start-up transformer (E-TR-S) to the Class 1E buses is through the non-segregated bus to switchgear SM-1 and SM-3. Each of these NSR switchgear feed to the Class 1E switchgear for Division 1 and Division 2 (SM-7 and SM-8, respectively).

The 115-kV grid is connected to the onsite power source by oil circuit breaker E-CB-TRB located in the Columbia transformer yard. The output of breaker E-CB-TRB is directly tied by switchyard bus to back-up transformer E-TR-B, which is then directly connected by cable (routed underground and then in tray) to the Class 1E switchgear for Division 1 and Division 2 (SM-7 and SM-8 respectively).

The boundary points for the SBO license renewal off-site power recovery paths are breaker E-CB-TRS and breaker E-CB-TRB. The breakers associated with the SBO license renewal power off-site power recovery paths are shown in Figure 2.5-1.

The control circuits for the circuit breakers associated with the SBO license renewal off-site power recovery paths are in scope as well as the batteries that power these circuits.

Figure 2.5-1
Columbia's Onsite and Offsite Power



As shown in Figure 2.5-1, connection to the grid is made at breaker E-CB-TRS (also entitled A809) in the Ashe substation for the 230-kV grid connection and at oil circuit breaker E-CB-TRB (in the Columbia transformer yard) for the 115-kV grid connection.

Table 2.5-1
Electrical and Instrumentation and Control Systems
Components Subject to Aging Management Review

Component and Commodity Group	Intended Function (as defined in Table 2.0-1)
Non-Environmentally Qualified Insulated Cables and Connections	Conduct Electricity
Non-Environmentally Qualified Low-Current Instrument Cables and Connections	Conduct Electricity
Non-Environmentally Qualified Medium-Voltage Power Cables	Conduct Electricity
Cable Connections (metallic parts)	Conduct Electricity
Fuse Holders (insulation, metallic clamp)	Conduct Electricity
Metal-Enclosed Bus, Non-Segregated (bus and connections)	Conduct Electricity
Metal-Enclosed Bus, Non-Segregated (enclosure assemblies)	Support (Structural)
Metal-Enclosed Bus, Non-Segregated (insulation and insulators)	Insulation
Switchyard Bus and Connections	Conduct Electricity
Transmission Conductors and Connections	Conduct Electricity
Uninsulated Ground Conductors and Connections	Conduct Electricity
High-Voltage Insulators	Insulation (and support)
Electrical Equipment Subject to 10 CFR 50.49 EQ Requirements	Various

3.0 AGING MANAGEMENT REVIEW RESULTS

For those systems, structures, and components (SSCs) identified as being subject to an aging management review (AMR) in Section 2, 10 CFR 54.21(a)(3) requires demonstration that the effects of aging will be adequately managed so that their intended functions will be maintained consistent with the current licensing basis for the period of extended operation.

This section provides the results of the AMR of the SSCs determined, during the scoping and screening processes, to be subject to an AMR. Organization of this section is based on NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule, Revision 6." This section is organized as follows:

- Aging Management of Reactor Vessel, Internals, and Reactor Coolant System (Section 3.1)
- Aging Management of Engineered Safety Features (Section 3.2)
- Aging Management of Auxiliary Systems (Section 3.3)
- Aging Management of Steam and Power Conversion Systems (Section 3.4)
- Aging Management of Containments, Structures, and Component Supports (Section 3.5)
- Aging Management of Electrical and Instrumentation and Controls (Section 3.6)

Results of the AMRs are presented in two types of tables:

Table 3.x.1 – where

'3' indicates the table pertains to a Section 3 AMR,

'x' indicates the table number from NUREG-1801, Volume 1; and

'1' indicates the first table type.

For example, in the Reactor Vessel, Internals, and Reactor Coolant System section, this table would be numbered 3.1.1 and in the Auxiliary Systems section, this table would be numbered 3.3.1. This table type will be referred to as "Table 1." These tables are derived from the corresponding tables in Volume 1 of NUREG-1801 and present summary information from the AMR results.

Table 3.x.2-y – where

‘3’ indicates LRA Section 3;

‘x’ indicates the table number from NUREG-1801, Volume 1;

‘2’ indicates the second table type; and

‘y’ indicates the specific system, structure or commodity being addressed.

For example, within the Reactor Vessel, Internals, and Reactor Coolant System section, the AMR results for the Reactor Pressure Vessel are presented in Table 3.1.2-1. In the Engineered Safety Features section, the AMR results for the Residual Heat Removal System are presented in Table 3.2.2-1, and the AMR results for the Reactor Core Isolation Cooling System are presented in Table 3.2.2-2. This table type will be referred to as “Table 2.” These tables present the results of the AMRs.

Table Description

NUREG-1801 contains the NRC staff’s generic evaluation of existing plant programs. It documents the technical basis for determining where existing plant programs are adequate without modification and where the programs should be augmented for the period of extended operation. The evaluation results documented in the report indicate that many of the existing plant programs are adequate to manage the aging effects for particular components or commodities within the scope of license renewal without change. NUREG-1801 also contains recommendations on the specific areas for which an existing program should be augmented for license renewal. In order to take full advantage of NUREG-1801, a comparison between the AMR results and the tables of NUREG-1801 has been made. The results of that comparison are provided in tables in this section.

The purpose of Table 1 (refer to Sample Table 1 below) is to provide a summary comparison of specific plant AMR details with the corresponding tables of NUREG-1801 Volume 1. The table is essentially the same as Tables 3.1-1 through 3.6-1 of NUREG-1800, except that the “ID” column has been renamed the “Item Number” column, the “component” column has been expanded to “component/commodity,” the “Type” column has been deleted and the “Related Item” column has been replaced by a “Discussion” column. The number in the “Item Number” column is the number in the “ID” column prefixed by the table number to provide the reviewer with a cross-reference from Table 1 to Table 2. The “Discussion” column is used to provide clarifying information. The following are examples of information that might be contained within the “Discussion” column.

- “Further Evaluation Recommended” – Information or reference to where that information is located.

- The name of a plant-specific program being used.
- Exceptions to NUREG-1801 assumptions.
- A discussion of how the line is consistent with the corresponding line item in NUREG-1801 Volume 1, when it may appear inconsistent.
- A discussion of how the item is different from the corresponding line item in NUREG-1801 Volume 1, when it may appear to be consistent (e.g., when there is exception taken to an aging management program that is listed in NUREG-1801).

The format of Table 1 provides the reviewer with a means of aligning a specific Table 1 row with the corresponding NUREG-1801 Volume 1 table row, thereby allowing for the ease of checking consistency.

Sample Table 1

Table 3.x.1 Summary of Aging Management Programs for __ Evaluated in Chapter __of NUREG-1801

Item Number	Component / Commodity	Aging Effect / Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.x.1-01					
3.x.1-02					
3.x.1-03					

Table 2 (refer to Sample Table 2 below) provides the detailed results of the AMRs for those components and commodities identified in LRA Section 2 as being subject to AMR. There will be a Table 2 for each system and structure in Section 2 with components and commodities subject to AMR. Table 2 consists of the following nine columns:

Component/Commodity – The first column identifies the component and commodity types from Section 2 that are subject to AMR. They are listed in alphabetical order. During the screening process, some components were incorporated into commodity groups based on similarity of their design or materials of construction. Use of commodity groups made it possible to address an entire group of components with a single evaluation. In the AMRs described in the following sections, further definition of commodity groups was performed based on design, material, environmental, and functional characteristics in order to disposition an entire group with a single AMR.

Intended Function(s) – The second column contains the license renewal intended function(s) (abbreviations are used for structural functions) for the listed component and commodity types. Definitions for the intended functions, and the corresponding abbreviations where used, of intended functions are contained in Table 2.0-1.

Material – The third column lists the particular materials of construction for the component and commodity type.

Environment – The fourth column lists the environment to which the component and commodity types are exposed. Internal and external environments are indicated. The internal and external environments used in the AMRs are listed below in Table 3.0-1 and Table 3.0-2, respectively.

Aging Effect Requiring Management – As part of the AMR process, aging effects requiring management are identified for material and environment combinations. These are listed in the fifth column. The AMR methodology is based on generic industry guidance for determining aging effects for electrical, mechanical, and structural components and commodities based on the materials of construction and applicable environmental conditions. The material and environment-based rules in the industry guidance documents are derived from known age-related degradation mechanisms and industry operating experience. The aging effect determination is supplemented by review of Columbia operating experience.

Aging Management Program – The aging management program used to manage the aging effects requiring management is identified in the sixth column of Table 2. Aging management programs are described in Appendix B.

NUREG-1801 Volume 2 Item – Each combination of component and commodity type, material, environment, aging effect requiring management, and aging management program that is listed in Table 2 is compared to NUREG-1801 Volume 2, with consideration given to the standard (generic) notes, to identify consistencies. When they are identified, consistencies are documented by noting the appropriate NUREG-1801 Volume 2 item number in the seventh column of Table 2. If there is no corresponding item number in NUREG-1801 Volume 2, the entry is indicated as “not applicable” (N/A). Thus, a reviewer can readily identify where there is correspondence between the plant-specific tables and the NUREG-1801 Volume 2 tables.

Table 1 Item – Each combination of component and commodity, material, environment, aging effect requiring management, and aging management program that has an identified NUREG-1801 Volume 2 item number must also have a Table 3.x.1 line item reference number. The corresponding line item from Table 1 is listed in column eight of Table 2. If there is no corresponding item in NUREG-1801 Volume 1, the entry is indicated as “not applicable” (N/A). Therefore, the information from the two tables can be correlated.

Notes – In order to realize the full benefit of NUREG-1801, a series of notes is used to identify how the information in Table 2 aligns with the information in NUREG-1801

Volume 2. All notes designated with letters are standard (generic) notes that are the same from application to application throughout the industry. Additional information is provided in plant-specific notes, which are identified by a number. Plant-specific notes provide information or clarification regarding the AMR of the Table 2 line item. The generic and plant-specific notes are listed at the end of Sections 3.1 through 3.6. Section 3.1 uses plant-specific notes numbered in the 0100-series (e.g., 0101, 0102, etc.). Section 3.2 uses plant-specific notes numbered in the 0200-series; Section 3.3, in the 0300-series; Section 3.4, in the 0400-series; Section 3.5, in the 0500-series; and Section 3.6, in the 0600-series.

Generic notes A through E indicate that a useful comparison may be made between the Table 2 line item and NUREG-1801. Therefore, items associated with notes A through E will also contain a NUREG-1801 Volume 2 item and a reference to a Table 1 item.

Sample Table 2

Table 3.x.2-y Aging Management Review Results–<System Name>

Component Type or Component / Commodity	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes

Table Usage

For Table 1, each row is evaluated by the reviewer by moving from left to right across the table. No evaluation of information in the Component/Commodity, Aging Effect/Mechanism, Aging Management Programs, or Further Evaluation Recommended columns is required, as this information is taken directly from NUREG-1801 Volume 1. The Discussion column provides the information of interest to the reviewer by providing a summary of how the plant-specific AMR results align with the generic determinations contained in NUREG-1801 Volume 1.

Table 2 provides the AMR information for the plant, irrespective of any comparisons to NUREG-1801. In a given row in the table, the reviewer can see the intended function, material, environment, aging effect requiring management, and aging management program combination for a given component type or component / commodity within a system or structure. In addition, a referenced item number in column seven will identify any correlation between the information in Table 2 and that in NUREG-1801 Volume 2. The reviewer can refer to the item number in NUREG-1801 Volume 2, if desired, to verify the correlation. If the column indicates “not applicable” (N/A), no correspondence to NUREG-1801 Volume 2 was identified. As the reviewer continues across the table from left to right in a row, the next column is labeled Table 1 Item. If there is a reference number to a corresponding row in Table 1, the reviewer can refer to Table 1 to determine how the aging management program for this combination aligns with NUREG-1801. Table 2 provides a reviewer with a means to navigate from the component and commodity subject to an AMR in LRA Section 2 through the evaluation of aging management programs used to manage the effects of aging for the components and commodities.

Components and commodities in Tables 3.1.2-y, 3.2.2-y, 3.3.2-y, and 3.4.2-y that are nonsafety-related (NSR) and have a non-safety affecting safety (NSAS) function are listed in each table with an intended function of "Structural Integrity."

Plant Service Environments

Plant service (operating) environments for the purpose of license renewal are defined as the fluids and the ambient conditions of temperature, humidity, and radiation to which structures and components are exposed to during normal plant operating conditions. Plant service environments include both process environments internal to components, such as piping, valves, and tanks, and ambient environments on the external surfaces of structures and components. External surfaces of certain mechanical components may be exposed to predominantly internal environments (e.g., closed cycle cooling water, fuel oil, lubricating oil, raw water, treated water), such as for heat exchanger tubes and coils, or components that are submerged. In a similar manner, internal surfaces of certain mechanical components may be exposed to predominantly external environments (e.g., air-indoor uncontrolled, air-outdoor, gas), such as the air space inside tanks.

The following tables list the specific Columbia internal and external environments identified for license renewal. These environments are aligned with the corresponding terminology in NUREG-1801 as much as practical. A summary description of each Columbia environment is provided along with an identification of comparable environments used for aging management evaluation in, and defined in Chapter IX of, NUREG-1801.

Table 3.0-1
Internal Environments

Columbia Environment	Description
• Air • Moist Air	Air and moist air are defined to be air environments that contain some amount of moisture or contaminants. This includes: 1) air for use in plant components before it has been dried (moisture content is enough to facilitate general corrosion of steel); or 2) process air in locations where condensation, water pooling, or accumulation of contaminants could occur (moisture content is enough to facilitate crevice and pitting corrosion in various metals, as well as general corrosion of steel), or 3) air-water interfaces where alternate wetting and drying can concentrate contaminants and become aggressive species for metal, or 4) air contained in the space above the air-water interface inside a component that contains water. These environments encompass the following NUREG-1801 terminology: • Moist Air
• Dried Air • Gas	Dried air is compressed air that has been filtered, compressed and dried for use in plant equipment. Compressed air that has not been dried is evaluated as Air. Gas is a compressed gas such as carbon dioxide, Halon, hydrogen, nitrogen, Freon or other refrigeration gases. Such gases are received in bulk and are dry and free of contaminants, except when used in a manner that allows contact with water or condensation, in which case the gas becomes moist. These environments encompass the following NUREG-1801 terminology: • Dried Air • Gas
• Closed Cycle Cooling Water • Closed Cycle Cooling Water >60 °C (140 °F)	Includes treated water, as defined below, which is from and returns to a closed source (e.g., a tank) that is not open to the elements, and is used for cooling of plant components. That is, demineralized water that may contain additives in a: 1) closed cooling water system such as control room chilled water, fuel pool cooling, reactor closed cooling water, or residual heat removal; or 2) heat exchanger, cooler or other component in another system that is served by cooling water from a closed system. These environments encompass the following NUREG-1801 terminology: • Closed cycle cooling water • Closed cycle cooling water >60 °C (>140 °F)

Table 3.0-1 (continued)
Internal Environments

Columbia Environment	Description
• Fuel Oil	Fuel oil is usually diesel grade number 2 that is used to fuel engines, such as for the emergency diesel generators and the diesel-driven fire pump. Fuel oil is typically stored in tanks that are open to the environment (through vents) and will therefore be exposed to moist air at the surface level and possibly subject to water contamination. This environment encompasses the following NUREG-1801 terminology: • Fuel oil
• Lubricating Oil	Lubricating oil is typical of oil used in bearings, gear boxes, etc., for lubrication. Lubricating oil environments do not typically contain significant amounts of water, but are conservatively assumed to contain some amount of water contamination for the purposes of AMR. This environment encompasses the following NUREG-1801 terminology: • Lubricating oil
• Raw Water • Condensation	Water from a lake, pond, river or other reservoir that is open to the elements. Raw water is rough filtered and possibly treated with a biocide or other chemicals for control of micro- and macro-organisms. In addition, the contents of various sumps, tanks and other drainage components are evaluated as raw water environments, as is the potable water environment, since their contents are not treated or controlled by a credited site program and may contain unknown contaminants. The internal environment of drain pans and drain piping associated with air-handling units, fan cooler units, and moisture separators is untreated and uncontrolled water, resulting from the condensation of moisture from the ventilation air environment. These environments encompass the following NUREG-1801 terminology: • Condensation (internal) • Raw water
• Reactor Coolant	Treated water, as defined below, that is in the Reactor Coolant System and systems that are directly connected to it (Class 1 portions) at or near normal operating temperature. This environment encompasses the following NUREG-1801 terminology: • Reactor coolant • Reactor coolant >250 ºC (>482 ºF) • Steam

Table 3.0-1 (continued)
Internal Environments

Columbia Environment	Description
• Reactor Coolant with Neutron Fluence	The same as the reactor coolant environment with the added condition of neutron radiation (E, which represents average neutron energy, greater than 1MeV) in excess of 1x10E+17 neutrons per square centimeter (n/cm^2). This environment is unique to the region of the reactor pressure vessel immediately around the reactor core and the beltline region of the reactor vessel. This environment encompasses the following NUREG-1801 terminology: • Reactor coolant and neutron flux • Reactor coolant >250ºC (>482ºF) and neutron flux
• Sodium Pentaborate Solution • Steam • Treated Water • Treated Water > 60ºC (140ºF)	Treated water is filtered and chemically treated demineralized water that may be deaerated, treated with a biocide, antifreeze agent, corrosion inhibitor, dispersant or a combination of these treatments. This environment includes both the liquid and steam phase of chemically treated water, and sodium pentaborate dissolved in treated water. The closed cooling water and reactor coolant environments, defined above, are subsets of the treated water environment. These environments encompass the following NUREG-1801 terminology: • Secondary feedwater • Sodium pentaborate solution • Steam • Treated water • Treated water < 60ºC (<140ºF) • Treated water > 250ºC (>482ºF) • Treated water > 60ºC (>140ºF)

Table 3.0-2
External Environments

Columbia Environment	Description
• Adverse Localized Environment	Environment that could exist in limited plant areas caused by heat, moisture, oxygen, radiation, or voltage. Used for electrical evaluations only. This environment encompasses the following NUREG-1801 terminology: • Adverse localized environment caused by exposure to moisture and voltage • Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen • Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen or > 60-year service limiting temperature • Adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage

Table 3.0-2 (continued)
External Environments

Columbia Environment	Description
• Air • Air - Indoor • Air – Indoor Uncontrolled	Equipment and components located in buildings or structures such that they are protected from the elements are in an indoor air environment. Although nitrogen gas is used to maintain an "inert" atmosphere inside Primary Containment, the oxygen content may be up to 3.5 percent by volume. For conservatism, no distinction is made between Primary Containment and other indoor air environments with respect to oxygen content. Components in systems with high external surface temperatures (greater than 212 ºF) are evaluated as dry. Other component surfaces are exposed to moist ambient air (where moisture content is sufficient to facilitate general corrosion of steel), with the exception of surfaces in the control room envelope. Indoor air may be conditioned by filtering, heating, cooling, dehumidification, or some combination thereof. However, for AMR purposes, the environment is evaluated as "uncontrolled" (where moisture content is sufficient to facilitate general corrosion of steel). This environment is also used for the air inside HVAC components, components that are vented or otherwise open to ambient conditions, and components that are isolated and empty. The evaluation of this environment considers the potential for high temperatures, humidity, and radiation, where applicable, as well as aggressive contaminants on surfaces and structural components, including external air-water interfaces where alternate wetting and drying can concentrate contaminants and become aggressive species for metal. Components and commodities in indoor locations are sheltered from external weather conditions. These environments encompass the following NUREG-1801 terminology: • Air – indoor • Air – indoor controlled • Air – indoor uncontrolled • Air – indoor uncontrolled >35 ºC (>95 ºF) • Air with reactor coolant leakage • Air with steam or water leakage • Any • Moist air • System temperature up to 288 °C (550 °F) • Various

Table 3.0-2 (continued)
External Environments

Columbia Environment	Description
• Air – Outdoor	Equipment and components located in an outdoor air environment are exposed to heat, cold, various forms of precipitation, and the effects of sunlight. This outdoor air environment is a moist air environment with the potential for accumulation of aggressive contaminants. Components in systems with external surface temperatures the same or higher than ambient conditions due to normal system operation are evaluated as mostly dry with occasional short term wetting from precipitation. Components in systems with external surface temperatures below ambient conditions have the potential for prolonged wetting due to the formation of condensation. Columbia is located in an in-land high desert environment and is not near major industrial plants which could raise the possibility of exposure to sulfate or chloride attack. Condensation of vapor from the cooling towers may create hard water deposits on the high voltage insulators in the transformer yard. Without significant rainfall, the deposits may build up over time. The potential for a flashover may exist during the combined conditions of a freezing fog (due to the cooling tower plume) and sufficient contamination on the insulators. The desert environment creates the potential for conditions of high winds and wind-blown dust, which may affect equipment located in the yard. This environment encompasses the following NUREG-1801 terminology: • Air – outdoor • Moist air • Condensation • Any • Various
• Condensation	Components in systems with external surface temperatures below ambient conditions have the potential to be wet due to the formation of condensation. For indoor or outdoor air environments where the internal environment is at a lower temperature than the external environment, there is potential for condensation to form on the external surfaces. This environment encompasses the following NUREG-1801 terminology: • Condensation • Condensation (External) • Condensation (Internal)
• Concrete	The concrete environment is defined for components that are embedded (encased) in concrete, which forms a tight seal around the external surfaces of the component. This environment encompasses the following NUREG-1801 terminology: • Concrete

Table 3.0-2 (continued)
External Environments

Columbia Environment	Description
• Raw water • Water-flowing	Raw water is water from a lake, pond, river or other reservoir that is open to the elements. Raw water is rough filtered and possibly treated with a biocide or other chemicals for control of micro- and macro-organisms. In addition, the contents of various sumps, tanks and other drainage components are evaluated as raw water environments, as is the potable water environment, since their contents are not treated or controlled by a credited site program and may contain unknown contaminants. Water-flowing is raw water or ground water that is in movement and can affect components of structures including pump houses, ponds, and foundations. These environments encompass the following NUREG-1801 terminology: • Raw water • Water-flowing
• Treated water	Treated water is filtered and chemically treated demineralized water that may be deaerated, treated with a biocide, antifreeze agent, corrosion inhibitor, dispersant or a combination of these treatments. This environment includes both the liquid and steam phase of chemically treated water, and sodium pentaborate dissolved in treated water. This environment encompasses the following NUREG-1801 terminology: • Treated water
• Soil	The soil environment is defined as equipment or components beneath ground level in contact with soil and potentially subject to groundwater. Components that are buried are normally coated and wrapped to prevent the soil and groundwater from contacting the component surface. However, no credit for this coating and wrapping is explicitly taken in the identification of aging effects requiring evaluation. For structural evaluations, the soil environment may also be referred to as below grade. The below grade environment may be soil, sub-grade or structural backfill with the potential for groundwater. Coatings, if present, are not credited. This environment encompasses the following NUREG-1801 terminology: • Any • Groundwater • Soil • Various • Water flowing under foundation

[This page intentionally blank]

3.1 AGING MANAGEMENT OF REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

3.1.1 Introduction

Section 3.1 provides the results of the aging management reviews (AMRs) for those components identified in Section 2.3.1, Reactor Vessel, Internals, and Reactor Coolant System, as subject to AMR. The systems or portions of systems are described in the indicated sections.

- Reactor Pressure 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 Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component and commodity groups in this section. Text addressing summary items requiring further evaluation is provided in Section 3.1.2.2.

Note that the results of the AMRs for components included in Section 2.3.1.3 by the NSAS evaluations are provided in Section 3.3. The component types (piping and piping components) were compared to NUREG-1801 Chapter VII items.

3.1.2 Results

The following tables summarize the results of the AMR for systems in the Reactor Vessel, Internals, and Reactor Coolant System area.

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary

3.1.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The materials from which specific components and commodities are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above systems in the following sections.

3.1.2.1.1 Reactor Pressure Vessel

Materials

The materials of construction for the subject mechanical components of the reactor pressure vessel are:

- Nickel Alloy
- Nickel Alloy and Stainless Steel
- Stainless Steel
- Steel
- Steel with Stainless Steel Cladding

Environments

Subject mechanical components of the reactor pressure vessel are exposed to the following normal operating environments:

- Air-Indoor uncontrolled
- Reactor Coolant
- Reactor Coolant with Neutron Fluence

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the reactor pressure vessel:

- Cracking (due to Fatigue, Flaw Growth, Stress Corrosion Cracking, and Intergranular Attack)
- Loss of Material
- Loss of Pre-load
- Reduction of Fracture Toughness

Aging Management Programs

The following aging management programs address the aging effects requiring management for the reactor pressure vessel:

- Bolting Integrity Program
- BWR Feedwater Nozzle Program
- BWR Penetrations Program

- BWR Stress Corrosion Cracking Program
- BWR Vessel ID Attachment Welds Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- CRDRL Nozzle Program
- Inservice Inspection (ISI) Program
- Inservice Inspection (ISI) Program - IWF
- Reactor Head Closure Studs Program
- Reactor Vessel Surveillance Program

3.1.2.1.2 Reactor Vessel Internals

Materials

The materials of construction for the subject mechanical components of the Reactor Vessel Internals are:

- Cast Austenitic Stainless Steel (CASS)
- Nickel Alloy
- Stainless Steel
- Stainless Steel and Nickel Alloy

Environments

Subject mechanical components of the Reactor Vessel Internals are exposed to the following normal operating environments:

- Air-Indoor uncontrolled
- Reactor Coolant
- Reactor Coolant with Neutron Fluence

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Reactor Vessel Internals:

- Cracking (due to Fatigue, Flaw Growth, Flow Induced Vibration, Stress Corrosion Cracking/Intergranular Attack, and Stress Corrosion Cracking/Irradiation Assisted Stress Corrosion Cracking)
- Loss of Material

- Reduction of Fracture Toughness

Aging Management Programs

The following aging management programs and time-limited aging analyses address the aging effects requiring management for the reactor vessel internals:

- BWR Vessel Internals Program
- BWR Water Chemistry Program
- Inservice Inspection (ISI) Program
- Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program

3.1.2.1.3 Reactor Coolant Pressure Boundary

Materials

The materials of construction for subject mechanical components of the reactor coolant pressure boundary systems are:

- Cast Austenitic Stainless Steel (CASS)
- Stainless steel
- Steel

Environments

Subject mechanical components of the reactor coolant pressure boundary systems are exposed to the following normal operating environments:

- Air-Indoor Uncontrolled
- Closed Cycle Cooling Water
- Reactor Coolant
- Treated Water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of reactor coolant pressure boundary systems:

- Cracking (due to Fatigue, Flaw Growth, and Stress Corrosion Cracking/Intergranular Attack)
- Loss of Material

- Loss of Pre-load
- Reduction of Fracture Toughness
- Reduction in Heat Transfer

Aging Management Programs

The following aging management programs and activities address the aging effects requiring management for the reactor coolant pressure boundary systems:

- Bolting Integrity Program
- BWR Stress Corrosion Cracking Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion Program
- Heat Exchangers Inspection
- Inservice Inspection (ISI) Program
- Small Bore Class 1 Piping Inspection

3.1.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

For the Reactor Vessel, Internals, and Reactor Coolant System, those items requiring further evaluation are addressed in the following sections.

3.1.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis as defined in 10 CFR 54.3. Time-limited analyses are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this time-limited analysis is addressed separately in Section 4.3.

3.1.2.2.2 Loss of Material due to General, Pitting, and Crevice Corrosion

3.1.2.2.2.1 BWR Top Head and Top Head Nozzles, PWR Steam Generator Shell Assembly

The BWR Water Chemistry Program mitigates loss of material due to general, pitting, and crevice corrosion. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of components.

In addition to vessel top head nozzles, loss of material for other steel nozzles and safe ends including main steam, feedwater, RHR/LPCI, core spray, CRD return line and drain line is managed using the BWR Water Chemistry Program and Chemistry Program Effectiveness Inspection.

Loss of material for steel piping components and internal vessel attachment brackets is managed using the BWR Water Chemistry Program and Chemistry Program Effectiveness Inspection.

The associated item in Table 3.1.1 for steam generators (3.1.1-12) is applicable to PWRs only.

3.1.2.2.2.2 Isolation Condenser Components

Loss of material for BWR isolation condenser components is not applicable since the Columbia design does not include an isolation condenser. However, loss of material for the (carbon) steel portions of the main steam flow restrictors and steel flow elements is managed by the BWR Water Chemistry Program, the effectiveness of which is verified by the Chemistry Program Effectiveness Inspection.

3.1.2.2.2.3 Flanges, Nozzles, Penetrations, Pressure Housings, Safe Ends, and Vessel Shells, Heads, and Welds

The BWR Water Chemistry Program mitigates loss of material due to pitting and crevice corrosion. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to pitting and crevice corrosion through examination of components.

In addition to loss of material for the nozzles, safe ends and welds, loss of material for the thermal sleeves is also mitigated by the BWR Water Chemistry Program with the Chemistry Program Effectiveness Inspection verifying the effectiveness of the mitigation.

3.1.2.2.2.4 PWR Steam Generator Upper and Lower Shell and Transition Cone

The associated items in LRA Table 3.1.1 are applicable to PWRs only.

3.1.2.2.3 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement

3.1.2.2.3.1 Neutron Irradiation Embrittlement Time-Limited Aging Analyses

Certain aspects of neutron irradiation embrittlement are time-limited aging analyses, as defined in 10 CFR 54.3. Time-limited aging analyses are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this time-limited aging analysis is addressed separately in Section 4.2.

3.1.2.2.3.2 Reactor Vessel Beltline Shell, Nozzle, and Welds

Reduction of fracture toughness due to radiation embrittlement could occur for reactor vessel beltline region materials exposed to reactor coolant and neutron flux. The effects of embrittlement on the reactor vessel are discussed in Section 4.2. A reactor vessel materials surveillance program monitors radiation embrittlement of the steel reactor vessel beltline materials with stainless steel cladding. The Reactor Vessel Surveillance Program, and the results of its evaluation for license renewal, are presented in Appendix B.

3.1.2.2.4 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking (IGSCC)

3.1.2.2.4.1 BWR Top Head Enclosure Vessel Flange Leak Detection Lines

The reactor vessel flange leak detection nozzle and associated piping at Columbia is a Class 1 line that is normally dry. The stainless steel piping is evaluated for a reactor coolant environment and is therefore susceptible to cracking due to SCC. Cracking of the piping is managed by the Small Bore Class 1 Piping Inspection. The nickel-alloy nozzle is evaluated for a reactor coolant environment and is therefore susceptible to cracking due to SCC. Cracking of the nozzle is managed with a combination of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection.

In addition, loss of material for the stainless steel piping that forms the tube-in-a-tube seal cooler for the reactor recirculation pump is managed by the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection.

3.1.2.2.4.2 Isolation Condenser Components

Cracking of BWR isolation condenser components is not applicable since the Columbia design does not include an isolation condenser.

3.1.2.2.5 Crack Growth due to Cyclic Loading

The associated items in Table 3.1.1 are applicable to PWRs only.

3.1.2.2.6 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement and Void Swelling

The associated items in Table 3.1.1 are applicable to PWRs only.

3.1.2.2.7 Cracking due to Stress Corrosion Cracking

The associated items in Table 3.1.1 are applicable to PWRs only.

3.1.2.2.8 Cracking due to Cyclic Loading

3.1.2.2.8.1 Stainless Steel BWR Jet Pump Sensing Lines

For Columbia, the jet pump instrumentation lines inside the vessel are not subject to AMR, as they do not perform an intended function. The lines outside of the vessel are part of the reactor coolant pressure boundary and are subject to AMR for a reactor coolant environment. Cracking of the stainless steel lines external to the vessel is managed with a combination of the BWR Water Chemistry Program and the Small Bore Class 1 Piping Inspection.

3.1.2.2.8.2 Isolation Condenser Components

Cracking of BWR isolation condenser components is not applicable since the Columbia design does not include an isolation condenser.

3.1.2.2.9 Loss of Preload due to Stress Relaxation

The associated items in Table 3.1.1 are applicable to PWRs only.

3.1.2.2.10 Loss of Material due to Erosion in Steam Generators

The associated items in Table 3.1.1 are applicable to PWRs only.

3.1.2.2.11 Cracking due to Flow-Induced Vibration

Cracking due to flow-induced vibration for stainless steel steam dryers exposed to reactor coolant is managed by the BWR Vessel Internals Program.

3.1.2.2.12 Cracking due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking (IASCC)

The associated items in Table 3.1.1 are applicable to PWRs only.

3.1.2.2.13 Cracking due to Primary Water Stress Corrosion Cracking (PWSCC)

The associated items in Table 3.1.1 are applicable to PWRs only.

3.1.2.2.14 Wall Thinning due to Flow-Accelerated Corrosion in Steam Generators

The associated items in Table 3.1.1 are applicable to PWRs only.

3.1.2.2.15 Changes in Dimension due to Void Swelling

The associated items in Table 3.1.1 are applicable to PWRs only.

3.1.2.2.16 Cracking due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

The associated items in Table 3.1.1 are applicable 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

The associated items in Table 3.1.1 are applicable to PWRs only.

3.1.2.2.18 Quality Assurance for Aging Management of Non-safety Related Components

Quality assurance provisions applicable to license renewal are addressed in Appendix B, Section B.1.3.

3.1.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the Reactor Vessel, Internals, and Reactor Coolant System components. The section of the application that contains the time-limited aging analysis review results is indicated in parentheses.

1. Neutron Irradiation Embrittlement (Section 4.2, Reactor Vessel Neutron Embrittlement)
2. Metal Fatigue (Section 4.3, Metal Fatigue)
3. High Energy Line Break (HELB) Locations (Section 4.3.3, Reactor Coolant Pressure Boundary Piping and Piping Component Fatigue Analyses)
4. Reactor Vessel fracture mechanics analyses (Section 4.7.1 Reactor Vessel Shell Indications)
5. Main Steam Line Flow Restrictor Erosion (Section 4.7.3, Main Steam Line Flow Restrictor Erosion Analyses)

3.1.3 Conclusions

The Reactor Vessel, Internals, and Reactor Coolant System components and commodities subject to AMR have been identified in accordance with 10 CFR54.21. The aging management programs selected to manage the effects of aging for the mechanical components and commodities are identified in the following tables and Section 3.1.2.1. A description of the aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging associated with the Reactor Vessel, Internals, and Reactor Coolant System components and commodities will be managed so 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 Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-01	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. In addition to the support skirt, this item is also used for pressure boundary bolting exposed to air. Fatigue of the bolting is managed by the Bolting Integrity Program. Refer to Section 3.1.2.2.1 for further information.
3.1.1-02	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. Refer to Section 3.1.2.2.1 for further information.
3.1.1-03	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. Refer to Section 3.1.2.2.1 for further information.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-04	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	Not applicable. Cumulative fatigue damage of steel pump and valve closure bolting was not identified as a TLAA for Columbia. See Item Number 3.1.1-01 for fatigue of other pressure boundary bolting.
3.1.1-05	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. Refer to Section 3.1.2.2.1 for further information.
3.1.1-06	PWR only				
3.1.1-07	PWR only				
3.1.1-08	PWR only				
3.1.1-09	PWR only				
3.1.1-10	PWR only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-11	Steel top head enclosure (without cladding) top head nozzles (vent, top head spray or RCIC, and spare) exposed to reactor coolant	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. In addition to vessel top head nozzles, loss of material for other steel nozzles and for steel piping components and internal vessel attachment brackets is managed using BWR Water Chemistry Program and Chemistry Program Effectiveness Inspection. Refer to Section 3.1.2.2.2.1 for further information.
3.1.1-12	PWR only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	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	Loss of material for BWR isolation condenser components is not applicable as Columbia does not have an isolation condenser. The (carbon) steel portions of the main steam flow restrictors and steel flow elements are compared to this item. The Chemistry Program Effectiveness Inspection will verify the effectiveness of the BWR Water Chemistry Program to mitigate loss of material. Refer to Section 3.1.2.2.2.2 for further information.
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 for thermal sleeves is included under this item also managed by the combination of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection. Refer to Section 3.1.2.2.2.3 for further information.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	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. Refer to Section 3.1.2.2.2.3 for further information.
3.1.1-16	PWR only				
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 Part 50 and RG 1.99. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations.	Yes, TLAA	Loss of fracture toughness due to neutron irradiation is a TLAA. Refer to Section 3.1.2.2.3.1 for further information.
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. Refer to Section 3.1.2.2.3.2 for further information.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	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.	Yes, plant specific	Consistent with NUREG-1801. The stainless steel tubing that forms the tube-in-a-tube heat exchanger for the reactor recirculation pump is also compared to this item. Refer to Section 3.1.2.2.4.1 for further information.
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. Columbia has no isolation condenser. Refer to Section 3.1.2.2.4.2 for further information.
3.1.1-21	PWR only				
3.1.1-22	PWR only				
3.1.1-23	PWR only				
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	Not applicable. Refer to Section 3.1.2.2.8.1 for further information.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. Columbia has no isolation condenser. Refer to Section 3.1.2.2.8.2 for further information.
3.1.1-27	PWR only				
3.1.1-28	PWR only				
3.1.1-29	Stainless steel steam dryers exposed to reactor coolant	Cracking due to flow-induced vibration	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Cracking due to flow-induced vibration for stainless steel steam dryers exposed to reactor coolant is managed by the BWR Vessel Internals Program. Refer to Section 3.1.2.2.11 for further information.
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				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 (CRD) return line nozzles exposed to reactor coolant	Cracking due to cyclic loading	BWR CR Drive Return Line Nozzle	No	Consistent with NUREG-1801. Cracking of the CRD return line nozzle is managed by the CRDRL Nozzle Program.
3.1.1-39	Steel (with or without stainless steel cladding) feedwater nozzles exposed to reactor coolant	Cracking due to cyclic loading	BWR Feedwater Nozzle	No	Consistent with NUREG-1801. Cracking of the feedwater nozzle (including the safe end, safe end extension and thermal sleeve) is managed by the BWR Feedwater Nozzle Program.
3.1.1-40	Stainless steel and nickel alloy penetrations for CRD 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	Consistent with NUREG-1801. Cracking of the CRD penetrations (housing and stub tube), instrumentation penetrations, jet pump instrument penetrations (including the safe end), and incore penetrations is managed by the BWR Penetrations Program and the BWR Water Chemistry Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	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	Consistent with NUREG-1801. Cracking of stainless steel and nickel alloy piping components due to SCC/IGA is managed by the BWR Stress Corrosion Cracking Program and the BWR Water Chemistry Program.
3.1.1-42	Stainless steel and nickel alloy vessel shell attachment welds exposed to reactor coolant	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Vessel ID Attachment Welds and Water Chemistry	No	Consistent with NUREG-1801. Cracking of reactor vessel ID attachment welds is managed the BWR Vessel ID Attachment Welds Program and the BWR Water Chemistry Program.
3.1.1-43	Stainless steel fuel supports and control rod drive assemblies CRD 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. Cracking of the control rod guide tubes, orificed fuel support pieces and peripheral fuel support pieces is managed by the BWR Vessel Internals Program and the BWR Water Chemistry Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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, CRD 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. Cracking of the core plate, core spray lines, incore dry tubes, incore guide tubes, jet pump assemblies (cast and non-cast), LPCI coupling, shroud, and top guide is managed by the BWR Vessel Internals Program and the BWR Water Chemistry Program.
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. Loss of material (FAC) of steel piping and steel valve bodies in the reactor coolant system is managed by the Flow-Accelerated Corrosion (FAC) Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	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	Columbia does not have a mechanical access hole cover. The welded access hole cover is in line item 3.1.1-49. The Inservice Inspection (ISI) Program and the BWR Water Chemistry Program are credited with managing cracking of the pressure and liquid control (N11) nozzle, nozzle safe end, and thermal sleeve. A Note C is applied.
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	Consistent with NUREG-1801. Loss of material for multiple reactor vessel internals components is managed the by the Inservice Inspection (ISI) Program and the BWR Water Chemistry Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	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	Consistent with NUREG-1801. Cracking of piping and in-line components is managed by the BWR Water Chemistry Program and the Small Bore Class 1 Piping Inspection. This item is also used for cracking of reactor vessel components (bottom head, closure flange, shell rings, nozzles) managed by the Inservice Inspection (ISI) Program and the BWR Water Chemistry Program. A Note C is applied.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	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	Consistent with NUREG-1801. Cracking of the welded access hole covers is managed by the Inservice Inspection (ISI) Program and the BWR Water Chemistry Program. The access hole covers are of the retrofit (welded with crevices) design, but were modified during RPV construction to eliminate the crevice by back welding the crevices and installing a modified cover configuration.
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. Cracking of the reactor head closure studs is managed by the Reactor Head Closure Studs Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801					
Item Number	**Component/Commodity**	**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. Reduction of fracture toughness for the CASS portions of the jet pump assemblies, fuel support pieces, and CRD guide tubes (bases) is managed by the Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program.
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	Consistent with NUREG-1801 with exceptions. Cracking, loss of material, and loss of preload of reactor coolant pressure boundary bolting is managed by the Bolting Integrity Program, which contains exceptions.
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. The reactor coolant pressure boundary does not have any steel piping exposed to closed cycle cooling water.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-54	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable. The reactor coolant pressure boundary does not have any copper alloy components.
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	Consistent with NUREG-1801. Loss of fracture toughness for Class 1 pump casings and valve bodies is managed by the Inservice Inspection (ISI) Program. Reduction of fracture toughness for CASS valve bodies less than 4 inches is included in this item and managed by the Small Bore Class 1 Piping Inspection.
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. The reactor coolant pressure boundary does not include any copper alloy >15% Zn components.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	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 CRD 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	Not applicable. There is no CASS Class 1 piping subject to reduction of fracture toughness. The CRD housings are not CASS. The upstream portion of the main steam flow restrictors is CASS. However, the main steam flow restrictors are not part of the RCS pressure boundary. There is no significant pressure drop across these components and thus no driving force for the propagation of cracks. Un-propagated cracking does not affect the throttling function of the main steam flow restrictors. Cracking (due to any mechanism) of the main steam flow restrictors is not an aging effect requiring management.
3.1.1-58	PWR only				
3.1.1-59	PWR only				
3.1.1-60	PWR only				
3.1.1-61	PWR only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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				
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				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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				
3.1.1-85	Nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	N/A - No AEM or AMP	Consistent with NUREG-1801. Nickel alloy components exposed to air-indoor (uncontrolled) have no aging effects requiring management, therefore no aging management program is required.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	N/A - No AEM or AMP	Consistent with NUREG-1801. Stainless steel piping and in-line components exposed to air-indoor (uncontrolled) have no aging effects requiring management, therefore no aging management program. In addition, stainless steel nozzle safe ends and safe-end extensions, CRD housings, incore housings, and incore dry tubes exposed to air-indoor (uncontrolled) were determined to have no aging effects requiring management. A Note C is applied.
3.1.1-87	Steel piping, piping components, and piping elements in concrete	None	None	N/A - No AEM or AMP	Not applicable. There is no Class 1 piping in concrete.

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Shell and Heads									
1	RPV Bottom Head	Pressure boundary	Steel w. SS Cladding	Reactor coolant (Internal)	Cracking – SCC/IGA	Inservice Inspection	IV.C1-1	3.1.1-48	C 0103
2	RPV Bottom Head	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	C 0103
3	RPV Bottom Head	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
4	RPV Bottom Head	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
5	RPV Bottom Head	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
6	RPV Bottom Head	Pressure Boundary	Steel w. SS Cladding	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
7	RPV Bottom Head	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
8	RPV Shell (Beltline Plates)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant with Neutron Fluence (Internal)	Reduction of Fracture Toughness	Reactor Vessel Surveillance	IV.A1-14	3.1.1-18	A
9	RPV Shell (Beltline Welds)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant with Neutron Fluence (Internal)	Reduction of Fracture Toughness	Reactor Vessel Surveillance	IV.A1-14	3.1.1-18	A
10	RPV Shell (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Reactor coolant (Internal)	Cracking – SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	C 0103
11	RPV Shell (Closure Flange)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C1-1	3.1.1-48	C 0103
12	RPV Shell (Closure Flange)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
13	RPV Shell (Closure Flange)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
14	RPV Shell (Closure Flange)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
15	RPV Shell (Closure Flange)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
16	RPV Shell (Closure Flange)	Pressure Boundary	Steel w. SS Cladding	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
17	RPV Shell (Shell Rings)	Pressure boundary	Steel w. SS Cladding	Reactor coolant (Internal)	Cracking – SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	C 0103
18	RPV Shell (Shell Rings)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C1-1	3.1.1-48	C 0103
19	RPV Shell (Shell Rings)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
20	RPV Shell (Shell Rings)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
21	RPV Shell (Shell Rings)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
22	RPV Shell (Shell Rings)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
23	RPV Shell (Shell Rings)	Pressure Boundary	Steel w. SS Cladding	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
24	RPV Upper Head (Closure Flange)	Pressure Boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
25	RPV Upper Head (Closure Flange)	Pressure Boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
26	RPV Upper Head (Closure Flange)	Pressure Boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
27	RPV Upper Head (Closure Flange)	Pressure Boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
28	RPV Upper Head (Closure Flange)	Pressure Boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
29	RPV Upper Head (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Reactor coolant (Internal)	Cracking – SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	C 0103
30	RPV Upper Head (Closure Flange)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C1-1	3.1.1-48	C 0103

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
31	RPV Upper Head (Closure Flange)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
32	RPV Upper Head (Closure Flange)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
33	RPV Upper Head (Closure Flange)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
34	RPV Upper Head (Closure Flange)	Pressure Boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
35	RPV Upper Head (Closure Flange)	Pressure Boundary	Steel w. SS Cladding	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
36	RPV Upper Head (Dome)	Pressure Boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
37	RPV Upper Head (Dome)	Pressure Boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
38	RPV Upper Head (Dome)	Pressure Boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
39	RPV Upper Head (Dome)	Pressure Boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	A
40	RPV Upper Head (Dome)	Pressure Boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
Nozzles, Safe Ends, Safe End Extensions, Flanges, Caps, and Thermal Sleeves									
41	Nozzle N01 (Reactor Recirculation Outlets)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
42	Nozzle N01 (Reactor Recirculation Outlets)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
43	Nozzle N01 (Reactor Recirculation Outlets)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	C 0103
44	Nozzle N01 (Reactor Recirculation Outlets)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C1-1	3.1.1-48	C 0103
45	Nozzle N01 (Reactor Recirculation Outlets)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
46	Nozzle N01 (Reactor Recirculation Outlets)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
47	Nozzle N01 (Reactor Recirculation Outlets)	Pressure boundary	Steel w. SS Cladding	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
48	Nozzle N01 Safe End & Extension (Reactor Recirculation Outlets)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
49	Nozzle N01 Safe End & Extension (Reactor Recirculation Outlets)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
50	Nozzle N01 Safe End & Extension (Reactor Recirculation Outlets)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Stress Corrosion Cracking	IV.A1-1	3.1.1-41	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
51	Nozzle N01 Safe End & Extension (Reactor Recirculation Outlets)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-1	3.1.1-41	A
52	Nozzle N01 Safe End & Extension (Reactor Recirculation Outlets)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
53	Nozzle N01 Safe End & Extension (Reactor Recirculation Outlets)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
54	Nozzle N01 Safe End & Extension (Reactor Recirculation Outlets)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	IV.E-2	3.1.1-86	C
55	Nozzle N02 (Reactor Recirculation Inlets)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
56	Nozzle N02 (Reactor Recirculation Inlets)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
57	Nozzle N02 (Reactor Recirculation Inlets)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	C 0103
58	Nozzle N02 (Reactor Recirculation Inlets)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C1-1	3.1.1-48	C 0103
59	Nozzle N02 (Reactor Recirculation Inlets)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
60	Nozzle N02 (Reactor Recirculation Inlets)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
61	Nozzle N02 (Reactor Recirculation Inlets)	Pressure boundary	Steel w. SS Cladding	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
62	Nozzle N02 Safe End & Extension (Reactor Recirculation Inlets)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
63	Nozzle N02 Safe End & Extension (Reactor Recirculation Inlets)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
64	Nozzle N02 Safe End & Extension (Reactor Recirculation Inlets)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Stress Corrosion Cracking	IV.A1-1	3.1.1-41	A
65	Nozzle N02 Safe End & Extension (Reactor Recirculation Inlets)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-1	3.1.1-41	A
66	Nozzle N02 Safe End & Extension (Reactor Recirculation Inlets)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
67	Nozzle N02 Safe End & Extension (Reactor Recirculation Inlets)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
68	Nozzle N02 Safe End & Extension (Reactor Recirculation Inlets)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	IV.E-2	3.1.1-86	C
69	Nozzle N02 Thermal Sleeve (Reactor Recirculation Inlets)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
70	Nozzle N02 Thermal Sleeve (Reactor Recirculation Inlets)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
71	Nozzle N02 Thermal Sleeve (Reactor Recirculation Inlets)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Stress Corrosion Cracking	IV.A1-1	3.1.1-41	C
72	Nozzle N02 Thermal Sleeve (Reactor Recirculation Inlets)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-1	3.1.1-41	C

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
73	Nozzle N02 Thermal Sleeve (Reactor Recirculation Inlets)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	C
74	Nozzle N02 Thermal Sleeve (Reactor Recirculation Inlets)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	C
75	Nozzle N03 (Main Steam Outlets)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
76	Nozzle N03 (Main Steam Outlets)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
77	Nozzle N03 (Main Steam Outlets)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
78	Nozzle N03 (Main Steam Outlets)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
79	Nozzle N03 (Main Steam Outlets)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
80	Nozzle N03 Safe End (Main Steam Outlets)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
81	Nozzle N03 Safe End (Main Steam Outlets)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
82	Nozzle N03 Safe End (Main Steam Outlets)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
83	Nozzle N03 Safe End (Main Steam Outlets)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
84	Nozzle N03 Safe End (Main Steam Outlets)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
85	Nozzle N04 (Feedwater)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
86	Nozzle N04 (Feedwater)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	BWR Feedwater Nozzle	IV.A1-3	3.1.1-39	A
87	Nozzle N04 (Feedwater)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
88	Nozzle N04 (Feedwater)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
89	Nozzle N04 (Feedwater)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
90	Nozzle N04 Safe End (Feedwater)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
91	Nozzle N04 Safe End (Feedwater)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - Flaw Growth	BWR Feedwater Nozzle	IV.A1-3	3.1.1-39	C
92	Nozzle N04 Safe End (Feedwater)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Stress Corrosion Cracking	IV.A1-1	3.1.1-41	A
93	Nozzle N04 Safe End (Feedwater)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-1	3.1.1-41	A
94	Nozzle N04 Safe End (Feedwater)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
95	Nozzle N04 Safe End (Feedwater)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
96	Nozzle N04 Safe End (Feedwater)	Pressure boundary	Nickel Alloy	Air-indoor uncontrolled (External)	None	None	IV.E-1	3.1.1-85	A
97	Nozzle N04 Safe End Extension (Feedwater)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
98	Nozzle N04 Safe End Extension (Feedwater)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	BWR Feedwater Nozzle	IV.A1-3	3.1.1-39	C
99	Nozzle N04 Safe End Extension (Feedwater)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
100	Nozzle N04 Safe End Extension (Feedwater)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
101	Nozzle N04 Safe End Extension (Feedwater)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
102	Nozzle N04 Thermal Sleeve (Feedwater)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
103	Nozzle N04 Thermal Sleeve (Feedwater)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	BWR Feedwater Nozzle	IV.A1-3	3.1.1-39	C 0108
104	Nozzle N04 Thermal Sleeve (Feedwater)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Feedwater Nozzle	IV.A1-3	3.1.1-39	C 0108
105	Nozzle N04 Thermal Sleeve (Feedwater)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	C
106	Nozzle N04 Thermal Sleeve (Feedwater)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	C
107	Nozzle N05 and N16 (Core Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
108	Nozzle N05 and N16 (Core Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
109	Nozzle N05 and N16 (Core Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
110	Nozzle N05 and N16 (Core Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
111	Nozzle N05 and N16 (Core Spray)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
112	Nozzle N05 and N16 Safe End (Core Spray)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
113	Nozzle N05 and N16 Safe End (Core Spray)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
114	Nozzle N05 and N16 Safe End (Core Spray)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Stress Corrosion Cracking	IV.A1-1	3.1.1-41	A
115	Nozzle N05 and N16 Safe End (Core Spray)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-1	3.1.1-41	A
116	Nozzle N05 and N16 Safe End (Core Spray)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
117	Nozzle N05 and N16 Safe End (Core Spray)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
118	Nozzle N05 and N16 Safe End (Core Spray)	Pressure boundary	Nickel Alloy	Air-indoor uncontrolled (External)	None	None	IV.E-1	3.1.1-85	A
119	Nozzle N05 and N16 Safe End Extension (Core Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
120	Nozzle N05 and N16 Safe End Extension (Core Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
121	Nozzle N05 and N16 Safe End Extension (Core Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
122	Nozzle N05 and N16 Safe End Extension (Core Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
123	Nozzle N05 and N16 Safe End Extension (Core Spray)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
124	Nozzle N05 and N16 Thermal Sleeve (Core Spray)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
125	Nozzle N05 and N16 Thermal Sleeve (Core Spray)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
126	Nozzle N05 and N16 Thermal Sleeve (Core Spray)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Stress Corrosion Cracking	IV.A1-1	3.1.1-41	C
127	Nozzle N05 and N16 Thermal Sleeve (Core Spray)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-1	3.1.1-41	C
128	Nozzle N05 and N16 Thermal Sleeve (Core Spray)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	C
129	Nozzle N05 and N16 Thermal Sleeve (Core Spray)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	C

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
130	Nozzle N06 (RHR/LPCI)	Pressure boundary	Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
131	Nozzle N06 (RHR/LPCI)	Pressure boundary	Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
132	Nozzle N06 (RHR/LPCI)	Pressure boundary	Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
133	Nozzle N06 (RHR/LPCI)	Pressure boundary	Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
134	Nozzle N06 (RHR/LPCI)	Pressure boundary	Steel	Reactor Coolant with Neutron Fluence (Internal)	Reduction of Fracture Toughness	TLAA	IV.A1-4	3.1.1-17	A
135	Nozzle N06 (RHR/LPCI)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
136	Nozzle N06 Safe End (RHR/LPCI)	Pressure boundary	Nickel Alloy	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
137	Nozzle N06 Safe End (RHR/LPCI)	Pressure boundary	Nickel Alloy	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
138	Nozzle N06 Safe End (RHR/LPCI)	Pressure boundary	Nickel Alloy	Reactor Coolant with Neutron Fluence (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
139	Nozzle N06 Safe End (RHR/LPCI)	Pressure boundary	Nickel Alloy	Reactor Coolant with Neutron Fluence (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
140	Nozzle N06 Safe End (RHR/LPCI)	Pressure boundary	Nickel Alloy	Air-indoor uncontrolled (External)	None	None	IV.E-1	3.1.1-85	A
141	Nozzle N06 Safe End Extension (RHR/LPCI)	Pressure boundary	Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
142	Nozzle N06 Safe End Extension (RHR/LPCI)	Pressure boundary	Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
143	Nozzle N06 Safe End Extension (RHR/LPCI)	Pressure boundary	Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
144	Nozzle N06 Safe End Extension (RHR/LPCI)	Pressure boundary	Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
145	Nozzle N06 Safe End Extension (RHR/LPCI)	Pressure boundary	Steel	Reactor Coolant with Neutron Fluence (Internal)	Reduction of Fracture Toughness	TLAA	IV.A1-4	3.1.1-17	A
146	Nozzle N06 Safe End Extension (RHR/LPCI)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
147	Nozzle N06 Thermal Sleeve (RHR/LPCI)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
148	Nozzle N06 Thermal Sleeve (RHR/LPCI)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
149	Nozzle N06 Thermal Sleeve (RHR/LPCI)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking – SCC/IGA	BWR Stress Corrosion Cracking	IV.A1-1	3.1.1-41	C
150	Nozzle N06 Thermal Sleeve (RHR/LPCI)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking – SCC/IGA	BWR Water Chemistry	IV.A1-1	3.1.1-41	C
151	Nozzle N06 Thermal Sleeve (RHR/LPCI)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	C
152	Nozzle N06 Thermal Sleeve (RHR/LPCI)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	C
153	Nozzle N07 (Head Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
154	Nozzle N07 (Head Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
155	Nozzle N07 (Head Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	A
156	Nozzle N07 (Head Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	A
157	Nozzle N07 (Head Spray)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
158	Nozzle N07 Flange (Head Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
159	Nozzle N07 Flange (Head Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
160	Nozzle N07 Flange (Head Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
161	Nozzle N07 Flange (Head Spray)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
162	Nozzle N07 Flange (Head Spray)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
163	Nozzle N08 (Vent)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
164	Nozzle N08 (Vent)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
165	Nozzle N08 (Vent)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	A
166	Nozzle N08 (Vent)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	A
167	Nozzle N08 (Vent)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
168	Nozzle N08 Flange (Vent)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
169	Nozzle N08 Flange (Vent)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
170	Nozzle N08 Flange (Vent)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
171	Nozzle N08 Flange (Vent)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
172	Nozzle N08 Flange (Vent)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
173	Nozzle N09 (Jet Pump Instrumenta-tion)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
174	Nozzle N09 (Jet Pump Instrumenta-tion)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
175	Nozzle N09 (Jet Pump Instrumenta-tion)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Penetrations	IV.A1-5	3.1.1-40	A
176	Nozzle N09 (Jet Pump Instrumenta-tion)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-5	3.1.1-40	A
177	Nozzle N09 (Jet Pump Instrumenta-tion)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
178	Nozzle N09 (Jet Pump Instrumenta-tion)	Pressure boundary	Steel w. SS Cladding	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
179	Nozzle N09 (Jet Pump Instrumenta-tion)	Pressure boundary	Steel w. SS Cladding	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
180	Nozzle N09 Safe End (Jet Pump Instrumenta-tion)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
181	Nozzle N09 Safe End (Jet Pump Instrumenta-tion)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
182	Nozzle N09 Safe End (Jet Pump Instrumenta-tion)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Penetrations	IV.A1-5	3.1.1-40	C
183	Nozzle N09 Safe End (Jet Pump Instrumenta-tion)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-5	3.1.1-40	C

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
184	Nozzle N09 Safe End (Jet Pump Instrumentation)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
185	Nozzle N09 Safe End (Jet Pump Instrumentation)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
186	Nozzle N09 Safe End (Jet Pump Instrumentation)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	IV.E-2	3.1.1-86	C
187	Nozzle N10 (CRD Hydraulic Return Line)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
188	Nozzle N10 (CRD Hydraulic Return Line)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	CRDRL Nozzle	IV.A1-2	3.1.1-38	A
189	Nozzle N10 (CRD Hydraulic Return Line)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
190	Nozzle N10 (CRD Hydraulic Return Line)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	A
191	Nozzle N10 (CRD Hydraulic Return Line)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
192	Nozzle N10 Safe End and Cap (CRD Hydraulic Return Line)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
193	Nozzle N10 Safe End and Cap (CRD Hydraulic Return Line)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	CRDRL Nozzle	IV.A1-2	3.1.1-38	A
194	Nozzle N10 Safe End and Cap (CRD Hydraulic Return Line)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
195	Nozzle N10 Safe End and Cap (CRD Hydraulic Return Line)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
196	Nozzle N10 Safe End and Cap (CRD Hydraulic Return Line)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
197	Nozzle N11 (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
198	Nozzle N11 (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
199	Nozzle N11 (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.B1-4	3.1.1-46	C
200	Nozzle N11 (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.B1-4	3.1.1-46	C
201	Nozzle N11 (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
202	Nozzle N11 (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
203	Nozzle N11 (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
204	Nozzle N11 Safe End (Pressure and Liquid Control)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
205	Nozzle N11 Safe End (Pressure and Liquid Control)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
206	Nozzle N11 Safe End (Pressure and Liquid Control)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.B1-4	3.1.1-46	C 0107
207	Nozzle N11 Safe End (Pressure and Liquid Control)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.B1-4	3.1.1-46	C 0107
208	Nozzle N11 Safe End (Pressure and Liquid Control)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
209	Nozzle N11 Safe End (Pressure and Liquid Control)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
210	Nozzle N11 Safe End (Pressure and Liquid Control)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	IV.E-2	3.1.1-86	C
211	Nozzle N11 Thermal Sleeve and Coupling (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
212	Nozzle N11 Thermal Sleeve and Coupling (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
213	Nozzle N11 Thermal Sleeve and Coupling (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.B1-4	3.1.1-46	C 0107
214	Nozzle N11 Thermal Sleeve and Coupling (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.B1-4	3.1.1-46	C 0107
215	Nozzle N11 Thermal Sleeve and Coupling (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	C
216	Nozzle N11 Thermal Sleeve and Coupling (Pressure and Liquid Control)	Pressure boundary	Nickel Alloy and Stainless Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	C

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
217	Nozzle N12, N13, and N14 (Instrumentation)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
218	Nozzle N12, N13, and N14 (Instrumentation)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
219	Nozzle N12, N13, and N14 (Instrumentation)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
220	Nozzle N12, N13, and N14 (Instrumentation)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
221	Nozzle N12, N13, and N14 (Instrumentation)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
222	Nozzle N12, N13, and N14 (nozzle to vessel weld)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Penetrations	IV.A1-5	3.1.1-40	A 0109

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
223	Nozzle N12, N13, and N14 (nozzle to vessel weld)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-5	3.1.1-40	A 0109
224	Nozzle N15 (Drain)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
225	Nozzle N15 (Drain)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
226	Nozzle N15 (Drain)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
227	Nozzle N15 (Drain)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
228	Nozzle N15 (Drain)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
229	Nozzle N17 (Seal Leak Detector)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
230	Nozzle N17 (Seal Leak Detector)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
231	Nozzle N17 (Seal Leak Detector)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-10	3.1.1-19	E
232	Nozzle N17 (Seal Leak Detector)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking - SCC/IGA	Chemistry Program Effectiveness Inspection	IV.A1-10	3.1.1-19	E
233	Nozzle N17 (Seal Leak Detector)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
234	Nozzle N17 (Seal Leak Detector)	Pressure boundary	Nickel Alloy	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
235	Nozzle N17 (Seal Leak Detector)	Pressure boundary	Nickel Alloy	Air-indoor uncontrolled (External)	None	None	IV.E-1	3.1.1-85	A
236	Nozzle N18 (Spare)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
237	Nozzle N18 (Spare)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
238	Nozzle N18 (Spare)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
239	Nozzle N18 (Spare)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	A
240	Nozzle N18 (Spare)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
241	Nozzle N18 Flanges (Spare)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
242	Nozzle N18 Flanges (Spare)	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
243	Nozzle N18 Flanges (Spare)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
244	Nozzle N18 Flanges (Spare)	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
245	Nozzle N18 Flanges (Spare)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G 0101
Attachments and Housings									
246	CRD Penetration (Housing)	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
247	CRD Penetration (Housing)	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
248	CRD Penetration (Housing)	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Penetrations	IV.A1-5	3.1.1-40	A
249	CRD Penetration (Housing)	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-5	3.1.1-40	A
250	CRD Penetration (Housing)	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
251	CRD Penetration (Housing)	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
252	CRD Penetration (Housing)	Pressure Boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
253	CRD Penetration (Stub Tube)	Pressure Boundary	Nickel Alloy	Reactor Coolant (External)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A 0104
254	CRD Penetration (Stub Tube)	Pressure Boundary	Nickel Alloy	Reactor Coolant (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0104

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
255	CRD Penetration (Stub Tube)	Pressure Boundary	Nickel Alloy	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Penetrations	IV.A1-5	3.1.1-40	A 0104
256	CRD Penetration (Stub Tube)	Pressure Boundary	Nickel Alloy	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-5	3.1.1-40	A 0104
257	CRD Penetration (Stub Tube)	Pressure Boundary	Nickel Alloy	Reactor Coolant (External)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A 0104
258	CRD Penetration (Stub Tube)	Pressure Boundary	Nickel Alloy	Reactor Coolant (External)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A 0104
259	Incore Penetrations (Housing)	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
260	Incore Penetrations (Housing)	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
261	Incore Penetrations (Housing)	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Penetrations	IV.A1-5	3.1.1-40	A
262	Incore Penetrations (Housing)	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-5	3.1.1-40	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
263	Incore Penetrations (Housing)	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A
264	Incore Penetrations (Housing)	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A
265	Incore Penetrations (Housing)	Pressure Boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	IV.E-2	3.1.1-86	C
266	RPV Attachments & Welds (Core Spray Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A 0104
267	RPV Attachments & Welds (Core Spray Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0104
268	RPV Attachments & Welds (Core Spray Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Vessel ID Attachment Welds	IV.A1-12	3.1.1-42	A 0104

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
269	RPV Attachments & Welds (Core Spray Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-12	3.1.1-42	A 0104
270	RPV Attachments & Welds (Core Spray Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C 0104
271	RPV Attachments & Welds (Core Spray Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C 0104
272	RPV Attachments & Welds (Dryer Holddown Brackets)	Support	Steel	Reactor Coolant (External)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A 0104
273	RPV Attachments & Welds (Dryer Holddown Brackets)	Support	Steel	Reactor Coolant (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0104

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
274	RPV Attachments & Welds (Dryer Holddown Brackets)	Support	Steel	Reactor Coolant (External)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C 0104
275	RPV Attachments & Welds (Dryer Holddown Brackets)	Support	Steel	Reactor Coolant (External)	Loss of material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C 0104
276	RPV Attachments & Welds (Dryer Support Brackets)	Support	Nickel Alloy	Reactor Coolant (External)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A 0104
277	RPV Attachments & Welds (Dryer Support Brackets)	Support	Nickel Alloy	Reactor Coolant (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0104
278	RPV Attachments & Welds (Dryer Support Brackets)	Support	Nickel Alloy	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Vessel ID Attachment Welds	IV.A1-12	3.1.1-42	A 0104

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
279	RPV Attachments & Welds (Dryer Support Brackets)	Support	Nickel Alloy	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-12	3.1.1-42	A 0104
280	RPV Attachments & Welds (Dryer Support Brackets)	Support	Nickel Alloy	Reactor Coolant (External)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A 0104
281	RPV Attachments & Welds (Dryer Support Brackets)	Support	Nickel Alloy	Reactor Coolant (External)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A 0104
282	RPV Attachments & Welds (Feedwater Sparger Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A 0104
283	RPV Attachments & Welds (Feedwater Sparger Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0104

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
284	RPV Attachments & Welds (Feedwater Sparger Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Vessel ID Attachment Welds	IV.A1-12	3.1.1-42	A 0104
285	RPV Attachments & Welds (Feedwater Sparger Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-12	3.1.1-42	A 0104
286	RPV Attachments & Welds (Feedwater Sparger Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A 0104
287	RPV Attachments & Welds (Feedwater Sparger Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A 0104
288	RPV Attachments & Welds (Guide Rod Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A 0104

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
289	RPV Attachments & Welds (Guide Rod Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0104
290	RPV Attachments & Welds (Guide Rod Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Vessel ID Attachment Welds	IV.A1-12	3.1.1-42	A 0104
291	RPV Attachments & Welds (Guide Rod Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-12	3.1.1-42	A 0104
292	RPV Attachments & Welds (Guide Rod Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A 0104
293	RPV Attachments & Welds (Guide Rod Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A 0104
294	RPV Attachments & Welds (Jet Pump Riser Support Pads)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A 0104

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
295	RPV Attachments & Welds (Jet Pump Riser Support Pads)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0104
296	RPV Attachments & Welds (Jet Pump Riser Support Pads)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Vessel ID Attachment Welds	IV.A1-12	3.1.1-42	A 0104
297	RPV Attachments & Welds (Jet Pump Riser Support Pads)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-12	3.1.1-42	A 0104
298	RPV Attachments & Welds (Jet Pump Riser Support Pads)	Support	Stainless Steel	Reactor Coolant (External)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A 0104
299	RPV Attachments & Welds (Jet Pump Riser Support Pads)	Support	Stainless Steel	Reactor Coolant (External)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A 0104
300	RPV Attachments & Welds (Shroud Support)	Support	Nickel Alloy	Reactor Coolant (External)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A 0104

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
301	RPV Attachments & Welds (Shroud Support)	Support	Nickel Alloy	Reactor Coolant (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0104
302	RPV Attachments & Welds (Shroud Support)	Support	Nickel Alloy	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Vessel ID Attachment Welds	IV.A1-12	3.1.1-42	A 0104
303	RPV Attachments & Welds (Shroud Support)	Support	Nickel Alloy	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-12	3.1.1-42	A 0104
304	RPV Attachments & Welds (Shroud Support)	Support	Nickel Alloy	Reactor Coolant (External)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A 0104
305	RPV Attachments & Welds (Shroud Support)	Support	Nickel Alloy	Reactor Coolant (External)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A 0104
306	RPV Attachments & Welds (Surveillance Specimen Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A 0104

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
307	RPV Attachments & Welds (Surveillance Specimen Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0104
308	RPV Attachments & Welds (Surveillance Specimen Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Vessel ID Attachment Welds	IV.A1-12	3.1.1-42	A 0104
309	RPV Attachments & Welds (Surveillance Specimen Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-12	3.1.1-42	A 0104
310	RPV Attachments & Welds (Surveillance Specimen Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Loss of material	Chemistry Program Effectiveness Inspection	IV.A1-8	3.1.1-14	A 0104

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
311	RPV Attachments & Welds (Surveillance Specimen Brackets)	Support	Stainless Steel	Reactor Coolant (External)	Loss of material	BWR Water Chemistry	IV.A1-8	3.1.1-14	A 0104
312	RPV Stabilizer Brackets	Support	Steel	Air-indoor uncontrolled (External)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-02	A
313	RPV Stabilizer Brackets	Support	Steel	Air-indoor uncontrolled (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
314	RPV Support Skirt and Knuckle	Support	Steel	Air-indoor uncontrolled (External)	Cracking - Fatigue	TLAA	IV.A1-6	3.1.1-01	A
315	RPV Support Skirt and Knuckle	Support	Steel	Air-indoor uncontrolled (External)	Cracking - Flaw Growth	Inservice Inspection - IWF	N/A	N/A	H
316	RPV Support Skirt and Knuckle	Support	Steel	Air-indoor uncontrolled (External)	Loss of material	Inservice Inspection - IWF	N/A	N/A	H
317	RPV Support Skirt Bearing Plate	Support	Steel	Air-indoor uncontrolled (External)	Cracking - Fatigue	TLAA	IV.A1-6	3.1.1-01	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
318	RPV Support Skirt Bearing Plate	Support	Steel	Air-indoor uncontrolled (External)	Cracking - Flaw Growth	Inservice Inspection - IWF	N/A	N/A	H
319	RPV Support Skirt Bearing Plate	Support	Steel	Air-indoor uncontrolled (External)	Loss of material	Inservice Inspection - IWF	N/A	N/A	H
Bolting									
320	Pressure Boundary Bolting	Pressure Boundary	Steel	Air-indoor uncontrolled (External)	Cracking - Fatigue	Bolting Integrity	IV.A1-6	3.1.1-01	E
321	Pressure Boundary Bolting	Pressure Boundary	Steel	Air-indoor uncontrolled (External)	Cracking - SCC	Bolting Integrity	IV.C2-7	3.1.1-52	B 0102
322	Pressure Boundary Bolting	Pressure Boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	IV.C1-12	3.1.1-52	B
323	Pressure Boundary Bolting	Pressure Boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	IV.C1-10	3.1.1-52	B
324	RPV Closure Studs, Nuts and Washers	Pressure Boundary	Steel	Air-indoor uncontrolled (External)	Cracking - Fatigue	TLAA	IV.A1-7	3.1.1-2	A

Table 3.1.2-1 Aging Management Review Results - Reactor Pressure Vessel									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
325	RPV Closure Studs, Nuts and Washers	Pressure Boundary	Steel	Air-indoor uncontrolled (External)	Cracking - SCC	Reactor Head Closure Studs	IV.A1-9	3.1.1-50	A 0102
326	RPV Closure Studs, Nuts and Washers	Pressure Boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Reactor Head Closure Studs	N/A	N/A	H

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Control Rod Guide Tube (Bases only)	Support	CASS	Reactor Coolant (Internal)	Reduction of fracture toughness	Thermal Aging and Neutron Embrittlement of CASS	IV.B1-9	3.1.1-51	A
2	Control Rod Guide Tubes	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
3	Control Rod Guide Tubes	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Vessel Internals	IV.B1-8	3.1.1-43	C
4	Control Rod Guide Tubes	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Water Chemistry	IV.B1-8	3.1.1-43	C
5	Control Rod Guide Tubes	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Fatigue	TLAA	IV.B1-14	3.1.1-05	A
6	Control Rod Guide Tubes	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
7	Control Rod Guide Tubes	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A
8	Core Plate Assembly	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
9	Core Plate Assembly	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Vessel Internals	IV.B1-6	3.1.1-44	A
10	Core Plate Assembly	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Water Chemistry	IV.B1-6	3.1.1-44	A
11	Core Plate Assembly	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Fatigue	TLAA	IV.B1-14	3.1.1-05	A

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
12	Core Plate Assembly	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A
13	Core Plate Assembly	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A
14	Core Spray Line	Flow distribution	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
15	Core Spray Line	Flow distribution	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Vessel Internals	IV.B1-7	3.1.1-44	A
16	Core Spray Line	Flow distribution	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.B1-7	3.1.1-44	A
17	Core Spray Line	Flow distribution	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.B1-14	3.1.1-05	A
18	Core Spray Line	Flow distribution	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A
19	Core Spray Line	Flow distribution	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
20	In-core Dry Tubes	Pressure boundary	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
21	In-core Dry Tubes	Pressure boundary	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Vessel Internals	IV.B1-10	3.1.1-44	A
22	In-core Dry Tubes	Pressure boundary	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Water Chemistry	IV.B1-10	3.1.1-44	A
23	In-core Dry Tubes	Pressure boundary	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A
24	In-core Dry Tubes	Pressure boundary	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A
25	In-core Dry Tubes	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	C

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
26	In-core Guide Tubes	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
27	In-core Guide Tubes	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Vessel Internals	IV.B1-10	3.1.1-44	A
28	In-core Guide Tubes	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Water Chemistry	IV.B1-10	3.1.1-44	A
29	In-core Guide Tubes	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Fatigue	TLAA	IV.B1-14	3.1.1-05	A
30	In-core Guide Tubes	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
31	In-core Guide Tubes	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A
32	Jet Pump Assembly (Non-cast Parts)	Floodable volume	Stainless Steel and Nickel Alloy	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
33	Jet Pump Assembly (Non-cast Parts)	Floodable volume	Stainless Steel and Nickel Alloy	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Vessel Internals	IV.B1-13	3.1.1-44	A
34	Jet Pump Assembly (Non-cast Parts)	Floodable volume	Stainless Steel and Nickel Alloy	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Water Chemistry	IV.B1-13	3.1.1-44	A
35	Jet Pump Assembly (Non-cast Parts)	Floodable volume	Stainless Steel and Nickel Alloy	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Fatigue	TLAA	IV.B1-14	3.1.1-05	A

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
36	Jet Pump Assembly (Non-cast Parts)	Floodable volume	Stainless Steel and Nickel Alloy	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A
37	Jet Pump Assembly (Non-cast Parts)	Floodable volume	Stainless Steel and Nickel Alloy	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A
38	Jet Pump Assembly Castings	Floodable volume	CASS	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
39	Jet Pump Assembly Castings	Floodable volume	CASS	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Vessel Internals	IV.B1-13	3.1.1-44	A
40	Jet Pump Assembly Castings	Floodable volume	CASS	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Water Chemistry	IV.B1-13	3.1.1-44	A

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
41	Jet Pump Assembly Castings	Floodable volume	CASS	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Fatigue	TLAA	IV.B1-14	3.1.1-05	A
42	Jet Pump Assembly Castings	Floodable volume	CASS	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A
43	Jet Pump Assembly Castings	Floodable volume	CASS	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A
44	Jet Pump Assembly Castings	Floodable volume	CASS	Reactor Coolant with Neutron Fluence (Internal)	Reduction of Fracture Toughness	Thermal Aging and Neutron Embrittlement of CASS	IV.B1-11	3.1.1-51	A
45	LPCI Coupling	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
46	LPCI Coupling	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Vessel Internals	IV.B1-3	3.1.1-44	A
47	LPCI Coupling	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.B1-3	3.1.1-44	A

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
48	LPCI Coupling	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.B1-14	3.1.1-05	A
49	LPCI Coupling	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A
50	LPCI Coupling	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A
51	Orificed Fuel Support	Support	CASS	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
52	Orificed Fuel Support	Support	CASS	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Vessel Internals	IV.B1-8	3.1.1-43	C
53	Orificed Fuel Support	Support	CASS	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Water Chemistry	IV.B1-8	3.1.1-43	C
54	Orificed Fuel Support	Support	CASS	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
55	Orificed Fuel Support	Support	CASS	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A
56	Orificed Fuel Support	Support	CASS	Reactor Coolant with Neutron Fluence (Internal)	Reduction of Fracture Toughness	Thermal Aging and Neutron Embrittlement of CASS	IV.B1-9	3.1.1-51	A
57	Peripheral Fuel Support	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
58	Peripheral Fuel Support	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Vessel Internals	IV.B1-8	3.1.1-43	C
59	Peripheral Fuel Support	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Water Chemistry	IV.B1-8	3.1.1-43	C

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
60	Peripheral Fuel Support	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A
61	Peripheral Fuel Support	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A
62	Shroud	Floodable volume	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
63	Shroud	Floodable volume	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Vessel Internals	IV.B1-1	3.1.1-44	A
64	Shroud	Floodable volume	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Water Chemistry	IV.B1-1	3.1.1-44	A

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
65	Shroud	Floodable volume	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Fatigue	TLAA	IV.B1-14	3.1.1-05	A
66	Shroud	Floodable volume	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A
67	Shroud	Floodable volume	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A
68	Shroud Support Access Hole Covers	Floodable volume	Nickel Alloy	Reactor Coolant (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
69	Shroud Support Access Hole Covers	Floodable volume	Nickel Alloy	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.B1-5	3.1.1-49	A
70	Shroud Support Access Hole Covers	Floodable volume	Nickel Alloy	Reactor Coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.B1-5	3.1.1-49	A

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
71	Shroud Support Access Hole Covers	Floodable volume	Nickel Alloy	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.B1-14	3.1.1-05	A
72	Shroud Support Access Hole Covers	Floodable volume	Nickel Alloy	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A
73	Shroud Support Access Hole Covers	Floodable volume	Nickel Alloy	Reactor Coolant (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A
74	Steam Dryer	Structural integrity	Stainless Steel	Reactor Coolant (Internal)	Cracking - FIV	BWR Vessel Internals	IV.B1-16	3.1.1-29	E
75	Top Guide	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Flaw Growth	BWR Vessel Internals	N/A	N/A	H
76	Top Guide	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Vessel Internals	IV.B1-17	3.1.1-44	A

Table 3.1.2-2 Aging Management Review Results - Reactor Vessel Internals									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
77	Top Guide	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - SCC/IASCC	BWR Water Chemistry	IV.B1-17	3.1.1-44	A
78	Top Guide	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Cracking - Fatigue	TLAA	IV.B1-14	3.1.1-05	A
79	Top Guide	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	BWR Water Chemistry	IV.B1-15	3.1.1-47	A
80	Top Guide	Support	Stainless Steel	Reactor Coolant with Neutron Fluence (Internal)	Loss of Material	Inservice Inspection	IV.B1-15	3.1.1-47	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Annubar	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H
2	Annubar	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	A
3	Annubar	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C1-1	3.1.1-48	A
4	Annubar	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
5	Annubar	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A
6	Annubar	Pressure Boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
7	Bolting	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	Loss of Pre-load	Bolting Integrity	IV.C2-8	3.1.1-52	B
8	Bolting	Pressure boundary	Steel	Air-Indoor Uncontrolled (External)	Cracking - Fatigue	Bolting Integrity	IV.A1-6	3.1.1-1	E

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
9	Bolting	Pressure Boundary	Steel	Air-Indoor Uncontrolled (External)	Cracking - SCC	Bolting Integrity	N/A	N/A	G
10	Bolting	Pressure boundary	Steel	Air-Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity	IV.C1-12	3.1.1-52	B
11	Bolting	Pressure boundary	Steel	Air-Indoor Uncontrolled (External)	Loss of Pre-load	Bolting Integrity	IV.C1-10	3.1.1-52	B
12	Condensing Unit	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
13	Condensing Unit	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H
14	Condensing Unit	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	A
15	Condensing Unit	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C1-1	3.1.1-48	A
16	Condensing Unit	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
17	Condensing Unit	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
18	Condensing Unit	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
19	Flow Elements < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
20	Flow Elements < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H
21	Flow Elements < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	A
22	Flow Elements < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C1-1	3.1.1-48	A
23	Flow Elements < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
24	Flow Elements < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A
25	Flow Elements < 4 inches	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
26	Flow Elements ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
27	Flow Elements ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
28	Flow Elements ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Stress Corrosion Cracking	IV.C1-8	3.1.1-41	A
29	Flow Elements ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-8	3.1.1-41	A
30	Flow Elements ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
31	Flow Elements ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A
32	Flow Elements ≥ 4 inches	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
33	Flow Elements ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
34	Flow Elements ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
35	Flow Elements ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-6	3.1.1-13	C

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
36	Flow Elements ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-6	3.1.1-13	C
37	Flow Elements ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material - FAC	Flow-Accelerated Corrosion	IV.C1-7	3.1.1-45	A 0105
38	Flow Elements ≥ 4 inches	Pressure boundary	Steel	Air-Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
39	Flow Elements/ Restrictors (Main Steam)	Throttling	CASS	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
40	Flow Elements/ Restrictors (Main Steam)	Throttling	CASS	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A
41	Flow Elements/ Restrictors (Main Steam)	Throttling	Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-6	3.1.1-13	C
42	Flow Elements/ Restrictors (Main Steam)	Throttling	Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-6	3.1.1-13	C

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
43	Heat Exchanger (tube in a tube)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-3	3.3.1-52	B
44	Heat Exchanger (tube in a tube)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	Heat Exchangers Inspection	VII.C2-3	3.3.1-52	E
45	Heat Exchanger (tube in a tube)	Heat transfer	Stainless Steel	Reactor Coolant (Internal)	Reduction in heat transfer	BWR Water Chemistry	V.D2-13	3.2.1-10	A
46	Heat Exchanger (tube in a tube)	Heat transfer	Stainless Steel	Reactor Coolant (Internal)	Reduction in heat transfer	Heat Exchangers Inspection	V.D2-13	3.2.1-10	A
47	Heat Exchanger (tube in a tube)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H
48	Heat Exchanger (tube in a tube)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.A1-10	3.1.1-19	E
49	Heat Exchanger (tube in a tube)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	Chemistry Program Effectiveness Inspection	IV.A1-10	3.1.1-19	E
50	Heat Exchanger (tube in a tube)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	BWR Water Chemistry	VII.A4-2	3.3.1-23	A
51	Heat Exchanger (tube in a tube)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-2	3.3.1-23	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
52	Heat Exchanger (tube in a tube)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
53	Heat Exchanger (tube in a tube)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
54	Heat Exchanger (tube in a tube)	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
55	Heat Exchanger (tube in a tube)	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
56	Heat Exchanger (tube in a tube)	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
57	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of Material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
58	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A
59	Orifice	Structural integrity	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
60	Orifice < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
61	Orifice < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H
62	Orifice < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	A
63	Orifice < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C1-1	3.1.1-48	A
64	Orifice < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
65	Orifice < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A
66	Orifice < 4 inches	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
67	Orifice < 4 inches	Throttling	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
68	Orifice < 4 inches	Throttling	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H
69	Orifice < 4 inches	Throttling	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
70	Orifice < 4 inches	Throttling	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C1-1	3.1.1-48	A
71	Orifice < 4 inches	Throttling	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
72	Orifice < 4 inches	Throttling	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A
73	Orifice < 4 inches	Throttling	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
74	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of Material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
75	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A
76	Piping	Structural integrity	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
77	Piping	Structural integrity	Steel	Air-Indoor Uncontrolled (Internal)	Loss of Material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0106

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
78	Piping & Fittings < 4 inches (RV flange leak off lines)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
79	Piping & Fittings < 4 inches (RV flange leak off lines)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H
80	Piping & Fittings < 4 inches (RV flange leak off lines)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	Small Bore Class 1 Piping Inspection	IV.A1-10	3.1.1-19	E
81	Piping & Fittings < 4 inches (RV flange leak off lines)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
82	Piping & Fittings < 4 inches (RV flange leak off lines)	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
83	Piping & Fittings < 4 inches (RV flange leak off lines)	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
84	Piping & Fittings < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
85	Piping & Fittings < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H
86	Piping & Fittings < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	A
87	Piping & Fittings < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C1-1	3.1.1-48	A
88	Piping & Fittings < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
89	Piping & Fittings < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A
90	Piping & Fittings < 4 inches	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
91	Piping & Fittings < 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
92	Piping & Fittings < 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H
93	Piping & Fittings < 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
94	Piping & Fittings < 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
95	Piping & Fittings < 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material - FAC	Flow-Accelerated Corrosion	IV.C1-7	3.1.1-45	A 0105
96	Piping & Fittings < 4 inches	Pressure boundary	Steel	Air-Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
97	Piping & Fittings ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
98	Piping & Fittings ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking – Flaw Growth	Inservice Inspection	N/A	N/A	H
99	Piping & Fittings ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Stress Corrosion Cracking	IV.C1-9	3.1.1-41	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
100	Piping & Fittings ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-9	3.1.1-41	A
101	Piping & Fittings ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
102	Piping & Fittings ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A
103	Piping & Fittings ≥ 4 inches	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
104	Piping & Fittings ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
105	Piping & Fittings ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
106	Piping & Fittings ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
107	Piping & Fittings ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
108	Piping & Fittings ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material - FAC	Flow-Accelerated Corrosion	IV.C1-7	3.1.1-45	A 0105

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
109	Piping & Fittings ≥ 4 inches	Pressure boundary	Steel	Air-Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
110	RRC Pump Casing	Pressure boundary	CASS	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
111	RRC Pump Casing	Pressure boundary	CASS	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
112	RRC Pump Casing	Pressure boundary	CASS	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Stress Corrosion Cracking	IV.C1-9	3.1.1-41	A
113	RRC Pump Casing	Pressure boundary	CASS	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-9	3.1.1-41	A
114	RRC Pump Casing	Pressure boundary	CASS	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
115	RRC Pump Casing	Pressure boundary	CASS	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A
116	RRC Pump Casing	Pressure boundary	CASS	Reactor Coolant (Internal)	Reduction of Fracture Toughness	Inservice Inspection	IV.C1-3	3.1.1-55	A
117	RRC Pump Stuffing Box	Pressure boundary	CASS	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
118	RRC Pump Stuffing Box	Pressure boundary	CASS	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
119	RRC Pump Casing	Pressure boundary	CASS	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
120	RRC Pump Motor Flange	Pressure boundary	Steel	Air-Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
121	Tubing	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
122	Tubing	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H
123	Tubing	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	A
124	Tubing	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C1-1	3.1.1-48	A
125	Tubing	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
126	Tubing	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
127	Tubing	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
128	Valve Bodies < 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
129	Valve Bodies < 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Cracking - Flaw Growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H
130	Valve Bodies < 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	A
131	Valve Bodies < 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Cracking - SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C1-1	3.1.1-48	A
132	Valve Bodies < 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
133	Valve Bodies < 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A
134	Valve Bodies < 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Reduction of Fracture Toughness	Small Bore Class 1 Piping Inspection	IV.C1-3	3.1.1-55	E
135	Valve Bodies < 4 inches	Pressure boundary	CASS	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
136	Valve Bodies < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
137	Valve Bodies < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H
138	Valve Bodies < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-1	3.1.1-48	A
139	Valve Bodies < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C1-1	3.1.1-48	A
140	Valve Bodies < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
141	Valve Bodies < 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A
142	Valve Bodies < 4 inches	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
143	Valve Bodies < 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
144	Valve Bodies < 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Small Bore Class 1 Piping Inspection	N/A	N/A	H

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
145	Valve Bodies < 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
146	Valve Bodies < 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
147	Valve Bodies < 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material - FAC	Flow-Accelerated Corrosion	IV.C1-7	3.1.1-45	A 0105
148	Valve Bodies < 4 inches	Pressure boundary	Steel	Air-Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
149	Valve Bodies ≥ 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
150	Valve Bodies ≥ 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
151	Valve Bodies ≥ 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Stress Corrosion Cracking	IV.C1-9	3.1.1-41	A
152	Valve Bodies ≥ 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-9	3.1.1-41	A
153	Valve Bodies ≥ 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
154	Valve Bodies ≥ 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A
155	Valve Bodies ≥ 4 inches	Pressure boundary	CASS	Reactor Coolant (Internal)	Reduction of Fracture Toughness	Inservice Inspection	IV.C1-3	3.1.1-55	A
156	Valve Bodies ≥ 4 inches	Pressure boundary	CASS	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
157	Valve Bodies ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
158	Valve Bodies ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
159	Valve Bodies ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Stress Corrosion Cracking	IV.C1-9	3.1.1-41	A
160	Valve Bodies ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking - SCC/IGA	BWR Water Chemistry	IV.C1-9	3.1.1-41	A
161	Valve Bodies ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.C1-14	3.1.1-15	A
162	Valve Bodies ≥ 4 inches	Pressure boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.C1-14	3.1.1-15	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
163	Valve Bodies ≥ 4 inches	Pressure boundary	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A
164	Valve Bodies ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Fatigue	TLAA	IV.C1-15	3.1.1-03	A
165	Valve Bodies ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
166	Valve Bodies ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material	BWR Water Chemistry	IV.A1-11	3.1.1-11	C
167	Valve Bodies ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	IV.A1-11	3.1.1-11	C
168	Valve Bodies ≥ 4 inches	Pressure boundary	Steel	Reactor Coolant (Internal)	Loss of Material - FAC	Flow-Accelerated Corrosion	IV.C1-7	3.1.1-45	A 0105
169	Valve Bodies ≥ 4 inches	Pressure boundary	Steel	Air-Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
170	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of Material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
171	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of Material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant Pressure Boundary									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
172	Valve Body	Structural integrity	Stainless Steel	Air-Indoor Uncontrolled (External)	None	None	IV.E-2	3.1.1-86	A

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 takes some 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 takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes:	
0101	NUREG-1801 Chapter IV does not list indoor air as an environment for carbon steel or low alloy steel components such as the vessel shell. This aging management review finds that there is no identified aging effect for these components whose temperature is >212 ºF based on their being exposed to indoor air.
0102	Only high strength bolting (yield strength > 150 ksi) and bolting with sulfide containing lubricants, whether carbon or stainless steel, are susceptible to SCC.
0103	NUREG-1801 item IV.C1-1 covers multiple types of cracking in multiple sizes of components. IV.C1-1 lists three programs: ISI, BWR Water Chemistry, and Small Bore Piping. BWR Water Chemistry does not affect cracking due to flaw growth (loading) and Small Bore Piping is not applicable for the reactor vessel. Therefore, using ISI as the aging management program is a match to NUREG-1801.
0104	The internal attachments inside the vessel only have an external environment, which is reactor coolant.
0105	The aging effect of loss of material due to flow accelerated corrosion applies only to Main Steam, Reactor Core Isolation Cooling, Reactor Feedwater, Reactor Recirculation, Reactor Water Clean-Up, and Residual Heat Removal system piping. Other areas of the reactor coolant pressure boundary do not have the conditions necessary for flow accelerated corrosion.
0106	The aging effect determination for the Air-indoor uncontrolled (Internal) environment is the same as the NUREG-1801 determination for an Air-indoor uncontrolled (External) environment because the material is the same and the internal environment is equivalent to the external environment evaluated in the NUREG-1801 item Monitoring of the external surface condition will be used to characterize the aging effects on the internal surfaces.
0107	GALL item IV.B1-4 is for nickel alloy and the safe ends are stainless steel. However, nickel alloy and stainless steel are similar for cracking due to SCC/IGA. The same GALL item was used for both the nickel alloy nozzles and the stainless steel safe ends for consistency.
0108	The BWR Feedwater Nozzle Program manages cracking due to any mechanism for the feedwater nozzle assembly, including the nozzle, safe end, and thermal sleeve.
0109	Cracking of the N12, N13, and N14 nozzle to vessel weld is included because the weld is nickel alloy, whereas the nozzle is low alloy steel. For other aging effects, the weld is included with the nozzle.

3.2 AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES

3.2.1 Introduction

Section 3.2 provides the results of the aging management reviews (AMRs) for those components identified in Section 2.3.2, Engineered Safety Features, as subject to AMR. The systems or portions of systems are described in the indicated sections of the application.

- Residual Heat Removal (RHR) System (Section 2.3.2.1)
- Reactor Core Isolation Cooling (RCIC) System (Section 2.3.2.2)
- High-Pressure Core Spray (HPCS) System (Section 2.3.2.3)
- Low-Pressure Core Spray (LPCS) System (Section 2.3.2.4)
- Standby Gas Treatment (SGT) System (Section 2.3.2.5)

Table 3.2.1, Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component and commodity groups in this section. Text addressing summary items requiring further evaluation is provided in Section 3.2.2.2.

3.2.2 Results

The following tables summarize the results of the AMR for the Engineered Safety Features (ESF) Systems.

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System

Table 3.2.2-3 Aging Management Review Results – High-Pressure Core Spray System

Table 3.2.2-4 Aging Management Review Results – Low-Pressure Core Spray System

Table 3.2.2-5 Aging Management Review Results – Standby Gas Treatment System

3.2.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The materials from which specific components and commodities are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above systems in the following sections.

3.2.2.1.1 Residual Heat Removal (RHR) System

Materials

The materials of construction for subject mechanical components of the RHR System are:

- Cast austenitic stainless steel (CASS)
- Copper alloy >15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the RHR System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Condensation
- Moist air
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the RHR System:

- Cracking
- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the RHR System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Heat Exchangers Inspection
- Open-Cycle Cooling Water Program
- Selective Leaching Inspection
- Supplemental Piping/Tank Inspection

3.2.2.1.2 Reactor Core Isolation Cooling (RCIC) System

Materials

The materials of construction for subject mechanical components of the RCIC System are:

- Copper alloy >15% Zn
- Cast austenitic stainless steel (CASS)
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the RCIC System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Moist air
- Lubricating oil
- Treated water
- Steam

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the RCIC System:

- Cracking
- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the RCIC System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion (FAC) Program
- Heat Exchangers Inspection
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection
- Preventive Maintenance - RCIC Turbine Casing
- Supplemental Piping/Tank Inspection

3.2.2.1.3 High-Pressure Core Spray (HPCS) System

Materials

The materials of construction for subject mechanical components of the HPCS System are:

- Cast austenitic stainless steel (CASS)
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the HPCS System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the HPCS System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the HPCS System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Selective Leaching Inspection
- Supplemental Piping/Tank Inspection

3.2.2.1.4 Low-Pressure Core Spray (LPCS) System

Materials

The materials of construction for subject mechanical components of the LPCS System are:

- Cast austenitic stainless steel (CASS)
- Copper alloy
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the LPCS System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Lubricating oil
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the LPCS System:

- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the LPCS System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Lubricating Oil Analysis
- Lubricating Oil Inspection
- Open-Cycle Cooling Water Program
- Selective Leaching Inspection
- Supplemental Piping/Tank Inspection

3.2.2.1.5 Standby Gas Treatment (SGT) System

Materials

The materials of construction for subject mechanical components of the SGT System are:

- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the SGT System are exposed to the following normal operating environments:

- Air-indoor uncontrolled

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of SGT System:

- Hardening and loss of strength
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the SGT System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Flexible Connection Inspection

3.2.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

For the Engineered Safety Features Systems, those items requiring further evaluation are addressed in the following sections.

3.2.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis, as defined in 10 CFR 54.3. Time-limited aging analyses are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this time-limited aging analysis is addressed separately in Section 4.3.4.

3.2.2.2.2 Loss of Material Due to Cladding Breach

The associated items in Table 3.2.1 are applicable to PWRs only.

3.2.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion

3.2.2.2.3.1 Containment Isolation Piping, Piping Components, and Piping Elements – Stagnant Flow Conditions

Containment isolation piping and components were grouped with similar piping and components having the same material, environment, aging effects, and aging management programs. As stated in Table 3.2.1, the piping and components matching the description of LRA item number 3.2.1-03 were included in the evaluation of components for LRA item number 3.2.1-05. Refer to Section 3.2.2.2.3.3 for the details of the evaluation of aging management for piping and components.

3.2.2.2.3.2 Piping, Piping Components, and Piping Elements – Exposed to Soil

As stated in Table 3.2.1, there are no components that compare to LRA item number 3.2.1-04. The ESF systems contain no buried stainless steel piping or piping components. Therefore, no further evaluation is necessary.

3.2.2.2.3.3 BWR Piping, Piping Components, and Piping Elements – Treated Water

Loss of material due to pitting and crevice corrosion for stainless steel piping components exposed to treated water in ESF systems is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to pitting and crevice corrosion through examination of stainless steel piping components.

There are no aluminum components for the ESF systems that refer to Table 3.2.1 item number 3.2.1-05.

3.2.2.2.3.4 Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material for stainless steel and copper alloy piping components exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to crevice and pitting corrosion through examination of stainless steel and copper alloy piping components.

Copper alloys with less than 15% zinc and less than 8% aluminum are not susceptible to loss of material due to pitting or crevice corrosion and thus have no aging effect requiring management.

3.2.2.2.3.5 Partially Encased Tanks – Raw Water

As stated in Table 3.2.1, there are no tanks at Columbia that compare to item number 3.2.1-07. The ESF systems contain no outdoor stainless steel tanks. Therefore, no further evaluation is necessary.

3.2.2.2.3.6 Piping, Piping Components, Piping Elements, and Tanks – Internal Condensation

This item is applied to external condensation on stainless steel valve bodies in the RHR System. The resulting loss of material is managed by the External Surfaces Monitoring Program, which consists of observation and surveillance activities to detect age-related degradation.

3.2.2.2.4 Reduction of Heat Transfer due to Fouling

3.2.2.2.4.1 Heat Exchanger Tubes – Lubricating Oil

Reduction of heat transfer for stainless steel and copper alloy heat exchanger tubes exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage reduction of heat transfer through examination of stainless steel and copper alloy heat exchanger tubes.

3.2.2.2.4.2 Heat Exchanger Tubes – Treated Water

Reduction of heat transfer due to fouling for stainless steel heat exchanger tubes exposed to treated water in ESF systems is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants to minimize fouling. The Heat Exchangers Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage reduction of heat transfer due to fouling through examination of stainless steel heat exchanger tubes.

3.2.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

Elastomer flexible connections subject to hardening and loss of strength are managed by the Flexible Connection Inspection, which is a new one-time inspection to detect and characterize aging of these connections.

3.2.2.2.6 Loss of Material Due to Erosion

The associated items in Table 3.2.1 are applicable to PWRs only.

3.2.2.2.7 Loss of Material due to General Corrosion, and Fouling

As stated in Table 3.2.1, there are no components that compare to item number 3.2.1-13. The nozzles used for the containment spray cooling mode of RHR are formed of brass (in the dry well) or stainless steel (in the wet well). The flow orifices are stainless steel. Neither loss of material due to general corrosion nor fouling were identified as aging effects requiring management for brass or stainless steel components. Therefore, no further evaluation is necessary.

3.2.2.2.8 Loss of Material due to General, Pitting, and Crevice Corrosion

3.2.2.2.8.1 BWR Piping, Piping Components, and Piping Elements

Loss of material due to general, pitting, and crevice corrosion for steel piping components exposed to treated water is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components.

In addition, loss of material due to general, pitting, and crevice corrosion for steel heat exchanger components is managed by the BWR Water Chemistry Program with the Chemistry Program Effectiveness Inspection providing verification of the effectiveness of the management.

3.2.2.2.8.2 Piping, Piping Components, and Piping Elements – Treated Water

Containment isolation piping and components are grouped with similar piping having the same material, environment, aging effects, and aging management programs. As stated in Table 3.2.1, the components matching the description of item number 3.2.1-15 are included in the evaluation of components for item number 3.2.1-14.

Loss of material due to general, pitting, and crevice corrosion for steel piping components exposed to treated water is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components.

3.2.2.2.8.3 Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material for steel piping and heat exchanger components exposed to lubricating oil is managed by the Lubricating Oil Analysis Program, including selective leaching for gray cast iron piping components. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to general, pitting, and crevice corrosion and selective leaching through examination of steel and gray cast iron piping components.

3.2.2.2.9 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion (MIC)

As stated in Table 3.2.1, there are no components that compare to item number 3.2.1-17. The ESF systems contain no components that are buried or otherwise exposed to soil. Therefore, no further evaluation is necessary.

3.2.2.2.10 Quality Assurance for Aging Management of Non-safety Related Components

Quality Assurance provisions applicable to license renewal are discussed in Appendix B, Section B.1.3.

3.2.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the Engineered Safety Features Systems components. The section of the application that contains the time-limited aging analysis review results is indicated in parentheses.

- Metal Fatigue (Section 4.3, Metal Fatigue)

3.2.3 Conclusions

The Engineered Safety Features Systems components and commodities subject to AMR have been identified in accordance with 10 CFR 54.21. The aging management programs selected to manage the effects of aging for the mechanical components and commodities are identified in the following tables and Section 3.2.2.1. A description of the aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging associated with the Engineered Safety Features Systems components and commodities will be managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis for 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

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-01	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. Refer to Section 3.2.2.2.1 for further information.
3.2.1-02	PWR Only				
3.2.1-03	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	Stainless steel containment isolation piping and components are addressed under Item Number 3.2.1-05. Refer to Section 3.2.2.2.3.1 for further information.
3.2.1-04	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. The ESF systems for Columbia contain no stainless steel piping, piping components, or piping elements that are exposed to soil. Refer to Section 3.2.2.2.3.2 for further information.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-05	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 BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for stainless steel piping, piping components, and piping elements that are exposed to treated water, including containment isolation piping and components. This item is also applied to stainless steel heat exchanger components that are exposed to treated water. A Note C is applied. Refer to Section 3.2.2.2.3.3 for further information.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-06	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	Consistent with NUREG-1801. The Lubricating Oil Analysis Program, in conjunction with the Lubricating Oil Inspection, is credited to manage loss of material for stainless steel and copper alloy (with greater than 15% zinc content) piping, piping components, and piping elements that are exposed to lubricating oil. For copper alloy piping and components with 15% or less zinc content, no aging effects are identified. A Note I is applied. This item is also applied to stainless steel heat exchanger components that are exposed to lubricating oil. A Note C is applied. Refer to Section 3.2.2.2.3.4 for further information.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-07	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 stainless steel tanks in the ESF systems that are exposed to raw water as a result of a breached moisture barrier. Refer to Section 3.2.2.2.3.5 for further information.
3.2.1-08	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	There are no stainless steel piping, piping components, piping elements, or tank internal surfaces that are exposed to condensation in the ESF systems. However, this item number is applied to external condensation of stainless steel valve bodies. The External Surfaces Monitoring Program is credited to manage loss of material. A Note E is applied. Refer to Section 3.2.2.2.3.6 for further information.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-09	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	Consistent with NUREG-1801. The Lubricating Oil Analysis Program, in conjunction with the Lubricating Oil Inspection, is credited to manage reduction in heat transfer for stainless steel and copper alloy heat exchanger tubes that are exposed to lubricating oil. Refer to Section 3.2.2.2.4.1 for further information.
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 BWR Water Chemistry Program, in conjunction with the Heat Exchangers Inspection, is credited to manage reduction in heat transfer for stainless steel heat exchanger tubes that are exposed to treated water. Refer to Section 3.2.2.2.4.2 for further information.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801					
Item Number	**Component/Commodity**	**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	Consistent with NUREG-1801, with exceptions. Elastomer flexible connections subject to hardening and loss of strength are managed by the Flexible Connection Inspection, which is a new one-time inspection to detect and characterize aging of these connections. Refer to Section 3.2.2.2.5 for further information.
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. The nozzles used in the containment spray systems for Columbia are formed of brass (drywell) and stainless steel (suppression chamber (wetwell)). The flow orifices are stainless steel. Refer to Section 3.2.2.2.7 for further information.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	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 BWR Water Chemistry Program, in conjunction with the Chemistry Effectiveness Inspection, is credited to manage loss of material for steel piping, piping components, and piping elements that are exposed to treated water. This item is also applied to steel heat exchanger components exposed to treated water. A Note C is applied. Refer to Section 3.2.2.2.8.1 for further information.
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	Steel containment isolation piping and piping components are addressed under Item Number 3.2.1-14. Refer to Section 3.2.2.2.8.2 for further information.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801. The Lubricating Oil Analysis Program, in conjunction with the Lubricating Oil Inspection, is credited to manage loss of material for steel piping, piping components, and piping elements that are exposed to lubricating oil, including selective leaching for gray cast iron. This item is also applied to steel heat exchanger components that are exposed to lubricating oil. A Note C is applied. Refer to Section 3.2.2.2.8.3 for further information.
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	Not applicable. There are no steel piping, piping components, or piping elements in the ESF systems that are exposed to soil. Refer to Section 3.2.2.2.9 for further information.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Not applicable. There are no stainless steel piping, piping components, or piping elements in the ESF systems that are exposed to treated water >60 °C (>140 °F).
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. The Flow-Accelerated Corrosion Program is credited to manage loss of material (wall thinning) due to flow-accelerated corrosion for steel piping, piping components, and piping elements in the ESF systems that are exposed to steam. Wall thinning due to flow-accelerated corrosion is not applicable for steel piping, piping components, and piping elements in the ESF systems that are exposed to treated water.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-20	Cast austenitic stainless steel (CASS) 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 piping, piping components, or piping elements in the ESF systems that are exposed to treated water >250 °C (>482 °F).
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. There is no high-strength steel closure bolting in the ESF systems that is exposed to air with steam or water leakage.
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. There is no steel closure bolting in the ESF systems that is exposed to air with steam or water leakage.
3.2.1-23	Steel bolting and closure bolting exposed to air – outdoor (external) or air – indoor uncontrolled (external)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. The Bolting Integrity Program is credited to manage loss of material for steel bolting that is exposed to air-outdoor (external) or air-indoor uncontrolled (external).

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	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	Consistent with NUREG-1801, with exceptions. The Bolting Integrity Program is credited to manage loss of pre-load for steel bolting that is exposed to air-indoor uncontrolled (external).
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	Not applicable. There are no stainless steel piping, piping components, or piping elements in the ESF systems that are exposed to closed-cycle cooling water >60 °C (>140 °F).
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. There are no steel piping, piping components, or piping elements in the ESF systems that are exposed to closed-cycle cooling water.
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	Not applicable. There are no steel heat exchanger components in the ESF systems that are exposed to closed-cycle cooling water.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Not applicable. There are no stainless steel piping, piping components, piping elements, or heat exchanger components in the ESF systems that are exposed to closed-cycle cooling water.
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	Not applicable. There are no copper alloy piping, piping components, piping elements, or heat exchanger components in the ESF systems that are exposed to closed-cycle cooling water.
3.2.1-30	Stainless steel and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Not applicable. There are no stainless steel or copper alloy heat exchanger tubes in the ESF systems that are exposed to closed-cycle cooling water.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	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 External Surfaces Monitoring Program is credited to manage loss of material for external surfaces of steel components, except for bolting, that are exposed to air-indoor uncontrolled (external) and condensation (external). For bolting, the Bolting Integrity Program is credited (see Item Number 3.2.1-23). This item is also applied to internal surfaces of steel piping components that are exposed to an air-indoor uncontrolled (internal) where it has been demonstrated that the internal environment is the same as the external environment. A Note C is applied.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-31 (cont'd)					The Supplemental Piping/Tank Inspection detects and characterizes loss of material at the air-water interface for steel components that penetrate the surface of the suppression pool (subject to alternate wetting and drying). A Note E is applied.
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 Preventive Maintenance – RCIC Turbine Casing program is credited to manage loss of material for steel turbine casings and associated piping and piping components in the RCIC System that are exposed to air-indoor uncontrolled (Internal). A Note E is applied. The External Surfaces Monitoring Program is credited to manage loss of material for the internal surfaces of other steel components of the ESF systems that are exposed to air-indoor uncontrolled (Internal) where it has been demonstrated that the internal environment is the same as the external environment. A Note E is applied.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. There are no steel encapsulation components in the ESF systems.
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	Not applicable. There are no steel piping, piping components, or piping elements in the ESF systems that are exposed to condensation (internal).
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	Not applicable. There are no steel containment isolation piping or component internal surfaces in the ESF systems that are exposed to raw water.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-36	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. The Open-Cycle Cooling Water Program is credited to manage loss of material for steel heat exchanger components that are exposed to raw water. This item is also applied to steel piping and piping components that are exposed to raw water. A Note D is applied.
3.2.1-37	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. The Open-Cycle Cooling Water Program is credited to manage loss of material for stainless steel piping, piping components, and piping elements that are exposed to raw water.
3.2.1-38	Stainless steel containment isolation piping and components internal surfaces exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. There are no stainless steel containment isolation piping and components internal surfaces in the ESF systems that are exposed to raw water.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-39	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. The Open-Cycle Cooling Water Program is credited to manage loss of material for stainless steel heat exchanger components that are exposed to raw water.
3.2.1-40	Steel and stainless steel heat exchanger tubes (serviced by open-cycle cooling water) exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. The Open-Cycle Cooling Water Program is credited to manage reduction in heat transfer for stainless steel heat exchanger tubes that are exposed to raw water.
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	Not applicable. There are no copper alloy >15% Zn piping, piping components, piping elements, or heat exchanger components in the ESF systems that are exposed to closed cycle cooling water.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 piping, piping components, or piping elements in the ESF systems that are exposed to closed-cycle cooling water.
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 piping, piping components, or piping elements in the ESF systems that are exposed to soil.
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. There is no gray cast iron motor cooler in the ESF systems that are exposed to treated water. However, this item is applied to gray cast iron pump casings that are exposed to treated water. A Note C is applied.
3.2.1-45	PWR Only				
3.2.1-46	PWR Only				
3.2.1-47	PWR Only				
3.2.1-48	PWR Only				

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 piping, piping components, or piping elements in the ESF systems that are exposed to air-indoor uncontrolled (internal or external).

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-51	Galvanized steel ducting exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. There is no galvanized steel ducting in the ESF systems that are exposed to air-indoor controlled (external). All air-indoor environments were conservatively evaluated as uncontrolled environments. The Columbia AMR process did not take credit for the zinc coating of galvanized steel to prevent the effects of aging on the base metal. All ducting in the ESF systems that is exposed to air-indoor uncontrolled (external) is addressed in Item Number 3.2.1-31.
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	Not applicable. There are no glass piping elements in the ESF systems exposed to air-indoor uncontrolled (external), lubricating oil, raw water, treated water, or treated borated water.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. No aging effects requiring management were identified for any stainless steel or copper alloy piping, piping components, and piping elements in the ESF systems that are exposed to air-indoor uncontrolled (external). This item is also applied to internal surfaces of stainless steel and copper alloy components that are exposed to an air-indoor uncontrolled (internal) where it has been demonstrated that the internal environment is the same as the external environment. This item is also applied to stainless steel heat exchanger components, and cooling unit drain pans. A Note C is applied.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 piping, piping components, or piping elements in the ESF systems that are exposed to air-indoor controlled (external). All air-indoor environments were conservatively evaluated as uncontrolled environments.
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 piping, piping components, or piping elements in the ESF systems that are 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	Not applicable. There are no steel, stainless steel, or copper alloy piping, piping components, or piping elements in the ESF systems that are exposed to gas.
3.2.1-57	PWR Only				

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Actuator Housing	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	C 0202
2	Actuator Housing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	V.E-5	3.2.1-24	B
5	Bolting	Pressure boundary	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	G
6	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of material	Bolting Integrity	N/A	N/A	G
7	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
8	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
9	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	V.E-5	3.2.1-24	B

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Flexible Connection	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
11	Flexible Connection	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
12	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
13	Heat Exchanger (RHR-HX-1A/B) (channel)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	V.D2-8	3.2.1-36	B
14	Heat Exchanger (RHR-HX-1A/B) (channel)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	V.E-10	3.2.1-31	A
15	Heat Exchanger (RHR-HX-1A/B) (shell)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	C
16	Heat Exchanger (RHR-HX-1A/B) (shell)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	C

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
17	Heat Exchanger (RHR-HX-1A/B) (shell)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
18	Heat Exchanger (RHR-HX-1A/B) (tube plugs)	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	C
19	Heat Exchanger (RHR-HX-1A/B) (tube plugs)	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	C
20	Heat Exchanger (RHR-HX-1A/B) (tubes)	Heat transfer	Stainless Steel	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	V.D2-12	3.2.1-40	B
21	Heat Exchanger (RHR-HX-1A/B) (tubes)	Heat transfer	Stainless Steel	Treated water (External)	Reduction in heat transfer	BWR Water Chemistry	V.D2-13	3.2.1-10	A
22	Heat Exchanger (RHR-HX-1A/B) (tubes)	Heat transfer	Stainless Steel	Treated water (External)	Reduction in heat transfer	Heat Exchangers Inspection	V.D2-13	3.2.1-10	A
23	Heat Exchanger (RHR-HX-1A/B) (tubes)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	V.D2-6	3.2.1-39	B

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
24	Heat Exchanger (RHR-HX-1A/B) (tubes)	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	C
25	Heat Exchanger (RHR-HX-1A/B) (tubes)	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	C
26	Heat Exchanger (RHR-HX-1A/B) (tubesheet)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	V.D2-6	3.2.1-39	B
27	Heat Exchanger (RHR-HX-1A/B) (tubesheet)	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	C
28	Heat Exchanger (RHR-HX-1A/B) (tubesheet)	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	C
29	Heat Exchanger (RHR-HX-2A/B/C (cover)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	C

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
30	Heat Exchanger (RHR-HX-2A/B/C (cover)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	C
31	Heat Exchanger (RHR-HX-2A/B/C (cover)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	C
32	Heat Exchanger (RHR-HX-2A/B/C (shell)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	C
33	Heat Exchanger (RHR-HX-2A/B/C (shell)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	C
34	Heat Exchanger (RHR-HX-2A/B/C (shell)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
35	Heat Exchanger (RHR-HX-2A/B/C (tubes)	Heat transfer	Stainless Steel	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	V.D2-12	3.2.1-40	B

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
36	Heat Exchanger (RHR-HX-2A/B/C (tubes)	Heat transfer	Stainless Steel	Treated water (External)	Reduction in heat transfer	BWR Water Chemistry	V.D2-13	3.2.1-10	A
37	Heat Exchanger (RHR-HX-2A/B/C (tubes)	Heat transfer	Stainless Steel	Treated water (External)	Reduction in heat transfer	Heat Exchangers Inspection	V.D2-13	3.2.1-10	A
38	Heat Exchanger (RHR-HX-2A/B/C (tubes)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	V.D2-6	3.2.1-39	B
39	Heat Exchanger (RHR-HX-2A/B/C (tubes)	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	C
40	Heat Exchanger (RHR-HX-2A/B/C (tubes)	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	C
41	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
42	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
43	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
44	Orifice	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
45	Orifice	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
46	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
47	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
48	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
49	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
50	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
51	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
52	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	C 0202
53	Piping	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G 0201
54	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	V.D2-8	3.2.1-36	D
55	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
56	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
57	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
58	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	V.E-7	3.2.1-31	E 0201
59	Piping	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	V.E-10	3.2.1-31	A

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
60	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
61	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
62	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
63	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
64	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	C 0202
65	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
66	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
67	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
68	Pump Casing (column) (RHR-P-2A/B/C)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
69	Pump Casing (column) (RHR-P-2A/B/C)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
70	Pump Casing (column) (RHR-P-2A/B/C)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
71	Pump Casing (column) (RHR-P-2A/B/C)	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
72	Pump Casing (column) (RHR-P-2A/B/C)	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
73	Pump Casing (RHR-P-2A/B/C)	Pressure boundary	Gray Cast Iron	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
74	Pump Casing (RHR-P-2A/B/C)	Pressure boundary	Gray Cast Iron	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
75	Pump Casing (RHR-P-2A/B/C)	Pressure boundary	Gray Cast Iron	Treated water (Internal)	Loss of material	Selective Leaching Inspection	V.D1-13	3.2.1-44	C
76	Pump Casing (RHR-P-2A/B/C)	Pressure boundary	Gray Cast Iron	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
77	Pump Casing (RHR-P-2A/B/C)	Pressure boundary	Gray Cast Iron	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
78	Pump Casing (RHR-P-2A/B/C)	Pressure boundary	Gray Cast Iron	Treated water (External)	Loss of material	Selective Leaching Inspection	V.D1-13	3.2.1-44	C
79	Pump Casing (RHR-P-3)	Pressure boundary	Cast Austenitic Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
80	Pump Casing (RHR-P-3)	Pressure boundary	Cast Austenitic Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
81	Pump Casing (RHR-P-3)	Pressure boundary	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
82	Pump Casing (shell) (RHR-P-2A/B/C)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
83	Pump Casing (shell) (RHR-P-2A/B/C)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
84	Pump Casing (shell) (RHR-P-2A/B/C)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
85	Separator	Flow control	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	C
86	Separator	Flow control	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	C
87	Separator	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	C
88	Separator	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	C
89	Separator	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
90	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0207
91	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
92	Spray Nozzle	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
93	Spray Nozzle	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
94	Spray Nozzle	Spray	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0207
95	Spray Nozzle	Spray	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
96	Spray Nozzle	Spray	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
97	Spray Nozzle	Spray	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
98	Strainer	Filtration	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
99	Strainer	Filtration	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
100	Strainer	Filtration	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
101	Strainer	Filtration	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
102	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
103	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
104	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
105	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
106	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
107	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
108	Valve Body	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	V.D1-25	3.2.1-37	B
109	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
110	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
111	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
112	Valve Body	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	V.D2-35	3.2.1-08	E 0203
113	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	C 0202
114	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	V.D2-8	3.2.1-36	D
115	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
116	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
117	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
118	Valve Body	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	V.E-10	3.2.1-31	A
119	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
120	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-1 Aging Management Review Results – Residual Heat Removal System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
121	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	C 0202
122	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
123	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
124	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	F
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	V.E-5	3.2.1-24	B
4	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	F
5	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
6	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	V.E-5	3.2.1-24	B
7	Filter Housing	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D2-30	3.2.1-16	A 0205
8	Filter Housing	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	V.D2-30	3.2.1-16	A
9	Filter Housing	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Filter Housing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D2-30	3.2.1-16	A
11	Filter Housing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	V.D2-30	3.2.1-16	A
12	Filter Housing	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
13	Filter Housing	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
14	Filter Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
15	Heat Exchanger (head) (RCIC-HX-2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	C 0207
16	Heat Exchanger (head) (RCIC-HX-2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	C
17	Heat Exchanger (shell) (RCIC-HX-1)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	Preventive Maintenance - RCIC Turbine Casing	V.D2-16	3.2.1-32	E 0204

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
18	Heat Exchanger (shell) (RCIC-HX-1)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
19	Heat Exchanger (shell) (RCIC-HX-2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D2-30	3.2.1-16	C
20	Heat Exchanger (shell) (RCIC-HX-2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	V.D2-30	3.2.1-16	C
21	Heat Exchanger (shell) (RCIC-HX-2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
22	Heat Exchanger (tubes) (RCIC-HX-2)	Heat transfer	Stainless Steel	Air-indoor uncontrolled (Internal)	Reduction in heat transfer	Heat Exchangers Inspection	N/A	N/A	G
23	Heat Exchanger (tubes) (RCIC-HX-2)	Heat transfer	Stainless Steel	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	V.D2-11	3.2.1-09	A
24	Heat Exchanger (tubes) (RCIC-HX-2)	Heat transfer	Stainless Steel	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Inspection	V.D2-11	3.2.1-09	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
25	Heat Exchanger (tubes) (RCIC-HX-2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	C 0207
26	Heat Exchanger (tubes) (RCIC-HX-2)	Pressure boundary	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	V.D1-24	3.2.1-06	C
27	Heat Exchanger (tubes) (RCIC-HX-2)	Pressure boundary	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Inspection	V.D1-24	3.2.1-06	C
28	Heat Exchanger (tubesheet) (RCIC-HX-2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	C 0207
29	Heat Exchanger (tubesheet) (RCIC-HX-2)	Pressure boundary	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	V.D1-24	3.2.1-06	C
30	Heat Exchanger (tubesheet) (RCIC-HX-2)	Pressure boundary	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Inspection	V.D1-24	3.2.1-06	C
31	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
32	Orifice	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-24	3.2.1-06	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
33	Orifice	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	V.D1-24	3.2.1-06	A
34	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
35	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
36	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
37	Orifice	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
38	Orifice	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
39	Orifice	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
40	Orifice	Throttling	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
41	Orifice	Throttling	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-24	3.2.1-06	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
42	Orifice	Throttling	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	V.D1-24	3.2.1-06	A
43	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
44	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
45	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
46	Piping	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	BWR Water Chemistry	VIII.B2-1	3.4.1-13	A
47	Piping	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.B2-1	3.4.1-13	A
48	Piping	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-2	3.4.1-37	A
49	Piping	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-2	3.4.1-37	E
50	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
51	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.D2-16	3.2.1-32	E
52	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	Preventive Maintenance - RCIC Turbine Casing	V.D2-16	3.2.1-32	E 0204
53	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D2-30	3.2.1-16	A
54	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	V.D2-30	3.2.1-16	A
55	Piping	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
56	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	A
57	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
58	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	V.D2-31	3.2.1-19	A
59	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
60	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
61	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
62	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	V.E-7	3.2.1-31	E 0201
63	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
64	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
65	Piping	Structural integrity	Stainless Steel	Steam (Internal)	Cracking	BWR Water Chemistry	VIII.B2-1	3.4.1-13	A
66	Piping	Structural integrity	Stainless Steel	Steam (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.B2-1	3.4.1-13	A
67	Piping	Structural integrity	Stainless Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-2	3.4.1-37	A
68	Piping	Structural integrity	Stainless Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-2	3.4.1-37	E

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
69	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
70	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.D2-16	3.2.1-32	E
71	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	A
72	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
73	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	V.D2-31	3.2.1-19	A
74	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
75	Pump Casing (RCIC-P-1)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
76	Pump Casing (RCIC-P-1)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
77	Pump Casing (RCIC-P-1)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
78	Pump Casing (RCIC-P-2)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.D2-16	3.2.1-32	E
79	Pump Casing (RCIC-P-2)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
80	Pump Casing (RCIC-P-3)	Pressure boundary	Cast Austenitic Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
81	Pump Casing (RCIC-P-3)	Pressure boundary	Cast Austenitic Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
82	Pump Casing (RCIC-P-3)	Pressure boundary	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
83	Pump Casing (RCIC-P-4)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.D2-16	3.2.1-32	E
84	Pump Casing (RCIC-P-4)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
85	Pump Casing (RCIC-P-5)	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D2-30	3.2.1-16	A 0205

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
86	Pump Casing (RCIC-P-5)	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	V.D2-30	3.2.1-16	A
87	Pump Casing (RCIC-P-5)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
88	Rupture Disc	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
89	Rupture Disc	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
90	Sparger	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
91	Sparger	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
92	Sparger	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
93	Sparger	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
94	Sparger	Spray	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
95	Sparger	Spray	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
96	Sparger	Spray	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
97	Sparger	Spray	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
98	Strainer	Filtration	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
99	Strainer	Filtration	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
100	Strainer	Filtration	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
101	Strainer	Filtration	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
102	Tank	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.D2-16	3.2.1-32	E
103	Tank	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
104	Trap Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	Preventive Maintenance - RCIC Turbine Casing	V.D2-16	3.2.1-32	E 0204
105	Trap Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	A
106	Trap Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
107	Trap Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	V.D2-31	3.2.1-19	A
108	Trap Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
109	Trap Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.D2-16	3.2.1-32	E
110	Trap Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
111	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
112	Tubing	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-24	3.2.1-06	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
113	Tubing	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	V.D1-24	3.2.1-06	A
114	Tubing	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	BWR Water Chemistry	VIII.B2-1	3.4.1-13	A
115	Tubing	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.B2-1	3.4.1-13	A
116	Tubing	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-2	3.4.1-37	A
117	Tubing	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-2	3.4.1-37	E
118	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
119	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
120	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
121	Tubing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D2-30	3.2.1-16	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
122	Tubing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	V.D2-30	3.2.1-16	A
123	Tubing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
124	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
125	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
126	Turbine Casing (RCIC-DT-1)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	Preventive Maintenance - RCIC Turbine Casing	V.D2-16	3.2.1-32	E
127	Turbine Casing (RCIC-DT-1)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
128	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0207
129	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D2-22	3.2.1-06	A 0205
130	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	V.D2-22	3.2.1-06	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
131	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
132	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
133	Valve Body	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-24	3.2.1-06	A
134	Valve Body	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	V.D1-24	3.2.1-06	A
135	Valve Body	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	BWR Water Chemistry	VIII.B2-1	3.4.1-13	A
136	Valve Body	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.B2-1	3.4.1-13	A
137	Valve Body	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-2	3.4.1-37	A
138	Valve Body	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-2	3.4.1-37	E
139	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
140	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
141	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
142	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.D2-16	3.2.1-32	E
143	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	Preventive Maintenance - RCIC Turbine Casing	V.D2-16	3.2.1-32	E 0204
144	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D2-30	3.2.1-16	A
145	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	V.D2-30	3.2.1-16	A
146	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	A
147	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
148	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	V.D2-31	3.2.1-19	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
149	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
150	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
151	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
152	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
153	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
154	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.D2-16	3.2.1-32	E
155	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	A
156	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
157	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	V.D2-31	3.2.1-19	A

Table 3.2.2-2 Aging Management Review Results – Reactor Core Isolation Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
158	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A

Table 3.2.2-3 Aging Management Review Results – High-Pressure Core Spray System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Actuator Housing	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.D2-16	3.2.1-32	E
2	Actuator Housing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	V.E-5	3.2.1-24	B
5	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
6	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	V.E-5	3.2.1-24	B
7	Flow Element	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
8	Flow Element	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
9	Flow Element	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-3 Aging Management Review Results – High-Pressure Core Spray System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Flow Element	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
11	Flow Element	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
12	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
13	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
14	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
15	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
16	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
17	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
18	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A

Table 3.2.2-3 Aging Management Review Results – High-Pressure Core Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
20	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.D2-16	3.2.1-32	E
21	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
22	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
23	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
24	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
25	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
26	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	V.E-7	3.2.1-31	E 0201
27	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-3 Aging Management Review Results – High-Pressure Core Spray System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
28	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
29	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.D2-16	3.2.1-32	E
30	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
31	Pump Casing (HPCS-P-1)	Pressure boundary	Gray Cast Iron	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
32	Pump Casing (HPCS-P-1)	Pressure boundary	Gray Cast Iron	Treated water (Internal)	Loss of material	Selective Leaching Inspection	V.D1-13	3.2.1-44	C
33	Pump Casing (HPCS-P-1)	Pressure boundary	Gray Cast Iron	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
34	Pump Casing (HPCS-P-1)	Pressure boundary	Gray Cast Iron	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
35	Pump Casing (HPCS-P-1)	Pressure boundary	Gray Cast Iron	Treated water (External)	Loss of material	Selective Leaching Inspection	V.D1-13	3.2.1-44	C
36	Pump Casing (HPCS-P-1)	Pressure boundary	Gray Cast Iron	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A

Table 3.2.2-3 Aging Management Review Results – High-Pressure Core Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
37	Pump Casing (HPCS-P-3)	Pressure boundary	Cast Austenitic Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
38	Pump Casing (HPCS-P-3)	Pressure boundary	Cast Austenitic Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
39	Pump Casing (HPCS-P-3)	Pressure boundary	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
40	Pump Casing (HPCS-P-1)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
41	Pump Casing (HPCS-P-1)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
42	Pump Casing (HPCS-P-1)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
43	Pump Casing (HPCS-P-1)	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
44	Pump Casing (HPCS-P-1)	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A

Table 3.2.2-3 Aging Management Review Results – High-Pressure Core Spray System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
45	Strainer (screen)	Filtration	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
46	Strainer (screen)	Filtration	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
47	Strainer (screen)	Filtration	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
48	Strainer (screen)	Filtration	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
49	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
50	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
51	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
52	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
53	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A

Table 3.2.2-3 Aging Management Review Results – High-Pressure Core Spray System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
54	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
55	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
56	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
57	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
58	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
59	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-4 Aging Management Review Results – Low-Pressure Core Spray System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Actuator Housing	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.D2-16	3.2.1-32	E
2	Actuator Housing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	V.E-5	3.2.1-24	B
5	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
6	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	V.E-5	3.2.1-24	B
7	Flow Element	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
8	Flow Element	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
9	Flow Element	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-4 Aging Management Review Results – Low-Pressure Core Spray System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Flow Element	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
11	Flow Element	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
12	Heat Exchanger (tubes and fittings) (LPCS-M-P/1 oil cooler)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	N/A	N/A	G
13	Heat Exchanger (tubes and fittings) (LPCS-M-P/1 oil cooler)	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	V.D2-9	3.2.1-09	A
14	Heat Exchanger (tubes and fittings) (LPCS-M-P/1 oil cooler)	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Inspection	V.D2-9	3.2.1-09	A
15	Heat Exchanger (tubes and fittings) (LPCS-M-P/1 oil cooler)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	N/A	N/A	G

Table 3.2.2-4 Aging Management Review Results – Low-Pressure Core Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
16	Heat Exchanger (tubes and fittings) (LPCS-M-P/1 oil cooler)	Pressure boundary	Copper Alloy	Lubricating oil (External)	None	None	V.D2-22	3.2.1-06	I 0206
17	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
18	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
19	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
20	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
21	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
22	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
23	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A

Table 3.2.2-4 Aging Management Review Results – Low-Pressure Core Spray System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
24	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
25	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
26	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
27	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
28	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
29	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
30	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	C 0202
31	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	V.E-7	3.2.1-31	E 0201
32	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	C 0202

Table 3.2.2-4 Aging Management Review Results – Low-Pressure Core Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
33	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
34	Pump Casing	Pressure boundary	Gray Cast Iron	Treated water (Internal)	Loss of material	Selective Leaching Inspection	V.D1-13	3.2.1-44	C
35	Pump Casing	Pressure boundary	Gray Cast Iron	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
36	Pump Casing	Pressure boundary	Gray Cast Iron	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
37	Pump Casing	Pressure boundary	Gray Cast Iron	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
38	Pump Casing	Pressure boundary	Gray Cast Iron	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
39	Pump Casing	Pressure boundary	Gray Cast Iron	Treated water (External)	Loss of material	Selective Leaching Inspection	V.D1-13	3.2.1-44	C
40	Pump Casing (LPCS-P-2)	Pressure boundary	Cast Austenitic Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A

Table 3.2.2-4 Aging Management Review Results – Low-Pressure Core Spray System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
41	Pump Casing (LPCS-P-2)	Pressure boundary	Cast Austenitic Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
42	Pump Casing (LPCS-P-2)	Pressure boundary	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
43	Pump Casing (LPCS-P-1)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
44	Pump Casing (LPCS-P-1)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
45	Pump Casing (LPCS-P-1)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
46	Pump Casing (LPCS-P-1)	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
47	Pump Casing (LPCS-P-1)	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
48	Strainer (screen)	Filtration	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A

Table 3.2.2-4 Aging Management Review Results – Low-Pressure Core Spray System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
49	Strainer (screen)	Filtration	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
50	Strainer (screen)	Filtration	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
51	Strainer (screen)	Filtration	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
52	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
53	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
54	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
55	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-28	3.2.1-05	A
56	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-28	3.2.1-05	A
57	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-4 Aging Management Review Results – Low-Pressure Core Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
58	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	V.D2-33	3.2.1-14	A
59	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	V.D2-33	3.2.1-14	A
60	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
61	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	C 0202
62	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A

Table 3.2.2-5 Aging Management Review Results – Standby Gas Treatment System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Annubar	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
2	Annubar	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	V.E-5	3.2.1-24	B
5	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
6	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	V.E-5	3.2.1-24	B
7	Drain Pan	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	C 0207
8	Drain Pan	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	C
9	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.B-1	3.2.1-32	E

Table 3.2.2-5 Aging Management Review Results – Standby Gas Treatment System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.B-3	3.2.1-31	A
11	Fan Housing	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.B-1	3.2.1-32	E
12	Fan Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.B-3	3.2.1-31	A
13	Filter Housing	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.B-1	3.2.1-32	E
14	Filter Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.B-3	3.2.1-31	A
15	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	Flexible Connection Inspection	V.B-4	3.2.1-11	E 0202
16	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	Flexible Connection Inspection	V.B-4	3.2.1-11	E
17	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
18	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-5 Aging Management Review Results – Standby Gas Treatment System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
19	Moisture Separator	Water removal	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.B-3	3.2.1-31	A
20	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
21	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
22	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.B-1	3.2.1-32	E
23	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.B-3	3.2.1-31	A
24	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.B-1	3.2.1-32	E
25	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.B-3	3.2.1-31	A
26	Spectacle Flange	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.B-1	3.2.1-32	E
27	Spectacle Flange	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.B-3	3.2.1-31	A

Table 3.2.2-5 Aging Management Review Results – Standby Gas Treatment System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
28	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0207
29	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
30	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0207
31	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
32	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
33	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
34	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0207
35	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
36	Valve Body	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.B-1	3.2.1-32	E

Table 3.2.2-5 Aging Management Review Results – Standby Gas Treatment System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
37	Valve Body	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.B-3	3.2.1-31	A
38	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0207
39	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
40	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.B-1	3.2.1-32	E
41	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.B-3	3.2.1-31	A

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 takes some 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 takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes:	
0201	The Supplemental Piping/Tank Inspection will manage loss of material at the air-water interface on the piping at the surface of the suppression pool.
0202	The aging effect determination for the Air-indoor uncontrolled (Internal) environment is the same as the NUREG-1801 determination for an Air-indoor uncontrolled (External) environment because the material is the same and the internal environment is equivalent to the external environment evaluated in the NUREG-1801 item. Monitoring of the external surface condition will be used to characterize the aging effects on the internal surfaces.
0203	This environment is the same as the NUREG-1801 environment except that it is an external rather than an internal environment.

Plant-Specific Notes:	
0204	In addition to the turbine casing itself, Preventive Maintenance - RCIC Turbine Casing will manage loss of material for piping and piping components associated with the steam supply and exhaust lines, to and including the barometric condenser, RCIC-HX-1.
0205	In addition to loss of material due to crevice, general, and pitting corrosion, the Lubricating Oil Analysis Program will also manage loss of material due to selective leaching, by assuring that there is no long-term water contamination. The Lubricating Oil Inspection activity will provide confirmation of the effectiveness of the Lubricating Oil Analysis Program in managing loss of material.
0206	The material is not brass or bronze > 15% Zn or aluminum bronze > 8% Aluminum, which is required for the mechanism of crevice or pitting corrosion to be applicable.
0207	The aging effect determination for the Air-indoor uncontrolled (Internal) environment is the same as the NUREG-1801 determination for an Air-indoor uncontrolled (External) environment because the material is the same and the internal environment is equivalent to the external environment evaluated in the NUREG-1801 item. There are no aging effects requiring management.

3.3 AGING MANAGEMENT OF AUXILIARY SYSTEMS

3.3.1 Introduction

Section 3.3 provides the results of the aging management reviews (AMRs) for those components identified in Section 2.3.3, Auxiliary Systems, as subject to AMR. The systems or portions of systems are described in the indicated sections. The Leak Detection System (Section 2.3.3.26), the Reactor Protection System (Section 2.3.3.40), and the Suppression Pool Temperature Monitoring System (Section 2.3.3.45) are not included here as they contain no mechanical components that are subject to AMR.

- Circulating Water System (Section 2.3.3.1)
- Condensate Processing Radioactive (Demineralizer) System (Section 2.3.3.2)
- Containment Atmosphere Control System (Section 2.3.3.3)
- Containment Exhaust Purge and Containment Supply Purge Systems (Section 2.3.3.4)
- Containment Instrument Air System (Section 2.3.3.5)
- Containment Monitoring System (Section 2.3.3.6)
- Containment Nitrogen System (Section 2.3.3.7)
- Containment Return Air System (Section 2.3.3.8)
- Containment Vacuum Breaker System (Section 2.3.3.9)
- Control Air System (Section 2.3.3.10)
- Control Rod Drive System (Section 2.3.3.11)
- Control Room Chilled Water System (Section 2.3.3.12)
- Demineralized Water System (Section 2.3.3.13)
- Diesel Building HVAC Systems (Section 2.3.3.14)
- Diesel Cooling Water System (Section 2.3.3.15)
- Diesel (Engine) Exhaust System (Section 2.3.3.16)
- Diesel Engine Starting Air System (Section 2.3.3.17)
- Diesel Fuel Oil System (Section 2.3.3.18)
- Diesel Generator System (Section 2.3.3.19)
- Diesel Lubricating Oil System (Section 2.3.3.20)
- Equipment Drains Radioactive System (Section 2.3.3.21)

- Fire Protection System (Section 2.3.3.22)
- Floor Drain System (Section 2.3.3.23)
- Floor Drain Radioactive System (Section 2.3.3.24)
- Fuel Pool Cooling System (Section 2.3.3.25)
- Miscellaneous Waste Radioactive System (Section 2.3.3.27)
- Plant Sanitary Drains System (Section 2.3.3.28)
- Plant Service Water System (Section 2.3.3.29)
- Potable Cold Water System (Section 2.3.3.30)
- Potable Hot Water System (Section 2.3.3.31)
- Primary Containment System (Section 2.3.3.32)
- Process Sampling System (Section 2.3.3.33)
- Process Sampling Radioactive System (Section 2.3.3.34)
- Pump House HVAC Systems (Section 2.3.3.35)
- Radwaste Building Chilled Water System (Section 2.3.3.36)
- Radwaste Building HVAC Systems (Section 2.3.3.37)
- Reactor Building HVAC Systems (Section 2.3.3.38)
- Reactor Closed Cooling Water System (Section 2.3.3.39)
- Reactor Water Cleanup System (Section 2.3.3.41)
- Service Air System (Section 2.3.3.42)
- Standby Liquid Control System (Section 2.3.3.43)
- Standby Service Water System (Section 2.3.3.44)
- Tower Makeup Water System (Section 2.3.3.46)
- Traversing Incore Probe System (Section 2.3.3.47)

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 that are applicable to component and commodity groups in this section. Text addressing summary items requiring further evaluation is provided in Section 3.3.2.2.

3.3.2 Results

The following tables summarize the results of the AMR for Auxiliary Systems:

Table 3.3.2-1	Aging Management Review Results – Circulating Water System
Table 3.3.2-2	Aging Management Review Results – Condensate Processing Radioactive (Demineralizer) System
Table 3.3.2-3	Aging Management Review Results – Containment Atmosphere Control System
Table 3.3.2-4	Aging Management Review Results – Containment Exhaust Purge and Containment Supply Purge Systems
Table 3.3.2-5	Aging Management Review Results – Containment Instrument Air System
Table 3.3.2-6	Aging Management Review Results – Containment Monitoring System
Table 3.3.2-7	Aging Management Review Results – Containment Nitrogen System
Table 3.3.2-8	Aging Management Review Results – Containment Return Air System
Table 3.3.2-9	Aging Management Review Results – Containment Vacuum Breaker System
Table 3.3.2-10	Aging Management Review Results – Control Air System
Table 3.3.2-11	Aging Management Review Results – Control Rod Drive System
Table 3.3.2-12	Aging Management Review Results – Control Room Chilled Water System
Table 3.3.2-13	Aging Management Review Results – Demineralized Water System
Table 3.3.2-14	Aging Management Review Results – Diesel Building HVAC Systems
Table 3.3.2-15	Aging Management Review Results – Diesel Cooling Water System
Table 3.3.2-16	Aging Management Review Results – Diesel (Engine) Exhaust System
Table 3.3.2-17	Aging Management Review Results – Diesel Engine Starting Air System
Table 3.3.2-18	Aging Management Review Results – Diesel Fuel Oil System

3.3.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The materials from which specific components and commodities are fabricated, the environments to which they are exposed, the aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above systems in the following sections.

3.3.2.1.1 Circulating Water System

Materials

The materials of construction for subject mechanical components of the Circulating Water System are:

- Concrete
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Circulating Water System are exposed to the following normal operating environments:

- Air-outdoor
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Circulating Water System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Circulating Water System:

- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- External Surfaces Monitoring Program
- Open-Cycle Cooling Water Program
- Selective Leaching Inspection

3.3.2.1.2 Condensate Processing Radioactive (Demineralizer) System

Materials

The material of construction for subject mechanical components of the Condensate Processing Radioactive (Demineralizer) System is:

- Steel

Environments

Subject mechanical components of the Condensate Processing Radioactive (Demineralizer) System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Condensate Processing Radioactive (Demineralizer) System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Condensate Processing Radioactive (Demineralizer) System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program

3.3.2.1.3 Containment Atmosphere Control System

Materials

The materials of construction for the subject mechanical components of the Containment Atmosphere Control System are:

- Stainless steel
- Steel

Environments

The subject mechanical components of the Containment Atmosphere Control System are exposed to the following normal plant environment:

- Air-indoor uncontrolled

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Atmosphere Control System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Containment Atmosphere Control System:

- Bolting Integrity Program
- External Surfaces Monitoring Program

3.3.2.1.4 Containment Exhaust Purge and Containment Supply Purge Systems

Materials

The materials of construction for the subject mechanical components of the Containment Exhaust Purge and Containment Supply Purge Systems are:

- Copper alloy > 15% Zn
- Elastomer
- Stainless steel
- Steel

Environments

The subject mechanical components of the Containment Exhaust Purge and Containment Supply Purge Systems are exposed to the following normal plant environments:

- Air-indoor uncontrolled
- Dried air
- Gas

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Exhaust Purge and Containment Supply Purge Systems:

- Hardening and loss of strength
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Containment Exhaust Purge and Containment Supply Purge Systems:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Flexible Connection Inspection

3.3.2.1.5 Containment Instrument Air System

Materials

The materials of construction for subject mechanical components of the Containment Instrument Air System are:

- Copper alloy >15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Containment Instrument Air System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Gas

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Instrument Air System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Containment Instrument Air System:

- Bolting Integrity Program
- External Surfaces Monitoring Program

3.3.2.1.6 Containment Monitoring System

Materials

The materials of construction for the subject mechanical components of the Containment Monitoring System are:

- Stainless steel
- Steel

Environments

The subject mechanical components of the Containment Monitoring System are exposed to the following normal plant environments:

- Air-indoor uncontrolled
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Monitoring System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Containment Monitoring System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection

3.3.2.1.7 Containment Nitrogen System

Materials

The materials of construction for subject mechanical components of the Containment Nitrogen System are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Stainless steel
- Steel

Environments

Subject mechanical components of the Containment Nitrogen System are exposed to the following normal operating environments:

- Air

- Air-indoor uncontrolled
- Air-outdoor
- Condensation
- Gas
- Steam

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Nitrogen System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Containment Nitrogen System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Flow Accelerated Corrosion (FAC) Program
- Selective Leaching Inspection

3.3.2.1.8 Containment Return Air System

Materials

The material of construction for the subject mechanical components of the Containment Return Air System is:

- Steel

Environments

The subject mechanical components of the Containment Return Air System are exposed to the following normal plant environment:

- Air-indoor uncontrolled

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Return Air System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Containment Return Air System:

- Bolting Integrity Program
- External Surfaces Monitoring Program

3.3.2.1.9 Containment Vacuum Breaker System

Materials

The materials of construction for the subject mechanical components of the Containment Vacuum Breaker System are:

- Stainless steel
- Steel

Environments

The subject mechanical components of the Containment Vacuum Breaker System are exposed to the following normal plant environments:

- Air-indoor uncontrolled
- Moist air
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Vacuum Breaker System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Containment Vacuum Breaker System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Supplemental Piping/Tank Inspection

3.3.2.1.10 Control Air System

Materials

The material of construction for subject mechanical components of the Control Air System is:

- Steel

Environments

Subject mechanical components of the Control Air System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Dried air

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Control Air System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Control Air System:

- Bolting Integrity Program
- External Surfaces Monitoring Program

3.3.2.1.11 Control Rod Drive System

Materials

The materials of construction for subject mechanical components of the Control Rod Drive System are:

- Copper alloy > 15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Control Rod Drive System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Gas
- Lubricating oil
- Treated water
- Treated water > 60 ºC (140 ºF)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Control Rod Drive System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Control Rod Drive System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection

- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection
- Selective Leaching Inspection

3.3.2.1.12 Control Room Chilled Water System

Materials

The materials of construction for subject mechanical components of the Control Room Chilled Water System are:

- Aluminum
- Copper alloy
- Glass
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Control Room Chilled Water System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Condensation
- Gas
- Lubricating oil
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Control Room Chilled Water System:

- Cracking
- Loss of material

- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Control Room Chilled Water System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection
- Open-Cycle Cooling Water Program

3.3.2.1.13 Demineralized Water System

Materials

The materials of construction for subject mechanical components of the Demineralized Water System are:

- Glass
- Stainless steel
- Steel

Environments

Subject mechanical components of the Demineralized Water System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Demineralized Water System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Demineralized Water System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection

3.3.2.1.14 Diesel Building HVAC Systems

Materials

The materials of construction for subject mechanical components of the Diesel Building HVAC systems are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Stainless steel
- Steel

Environments

Subject mechanical components of the Diesel Building HVAC systems are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Condensation
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Diesel Building HVAC systems:

- Cracking
- Hardening and loss of strength
- Loss of material

- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Diesel Building HVAC systems:

- Bolting Integrity Program
- Cooling Units Inspection
- External Surfaces Monitoring Program
- Open-Cycle Cooling Water Program

3.3.2.1.15 Diesel Cooling Water System

Materials

The materials of construction for subject mechanical components of the Diesel Cooling Water System are:

- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Glass
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Diesel Cooling Water System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Lubricating oil
- Moist air
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Diesel Cooling Water System:

- Hardening and loss of strength
- Loss of material
- Loss of pre-load
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Diesel Cooling Water System:

- Bolting Integrity Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Flexible Connection Inspection
- Heat Exchangers Inspection
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection
- Open-Cycle Cooling Water Program
- Supplemental Piping/Tank Inspection

3.3.2.1.16 Diesel (Engine) Exhaust System

Materials

The materials of construction for subject mechanical components of the Diesel (Engine) Exhaust System are:

- Copper alloy
- Elastomer
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Diesel (Engine) Exhaust System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Closed cycle cooling water
- Lubricating oil
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Diesel (Engine) Exhaust System:

- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Diesel (Engine) Exhaust System:

- Bolting Integrity Program
- Closed Cooling Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Diesel Systems Inspection
- External Surfaces Monitoring Program
- Heat Exchangers Inspection
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection

3.3.2.1.17 Diesel Engine Starting Air System

Materials

The materials of construction for subject mechanical components of the Diesel Engine Starting Air System are:

- Aluminum alloy
- Copper alloy
- Copper alloy > 15% Zn
- Glass
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Diesel Engine Starting Air System are exposed to the following normal operating environments:

- Air
- Air-indoor uncontrolled
- Lubricating oil
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Diesel Engine Starting Air System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Diesel Engine Starting Air System:

- Air Quality Sampling
- Bolting Integrity Program
- Diesel Starting Air Inspection

- External Surfaces Monitoring Program
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection

3.3.2.1.18 Diesel Fuel Oil System

Materials

The materials of construction for subject mechanical components of the Diesel Fuel Oil System are:

- Aluminum alloy
- Copper alloy > 15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Diesel Fuel Oil System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Concrete
- Fuel oil
- Soil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Diesel Fuel Oil System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Diesel Fuel Oil System:

- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Fuel Oil Chemistry
- Selective Leaching Inspection

3.3.2.1.19 Diesel Generator System

Materials

The materials of construction for subject mechanical components of the Diesel Generator System are:

- Copper alloy
- Glass
- Steel

Environments

Subject mechanical components of the Diesel Generator System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Lubricating oil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Diesel Generator System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Diesel Generator System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection

3.3.2.1.20 Diesel Lubricating Oil System

Materials

The materials of construction for subject mechanical components of the Diesel Lubricating Oil System are:

- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Glass
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Diesel Lubricating Oil System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Fuel oil
- Lubricating oil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Diesel Lubricating Oil System:

- Loss of material

- Loss of pre-load
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Diesel Lubricating Oil System:

- Bolting Integrity Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Heat Exchangers Inspection
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection

3.3.2.1.21 Equipment Drains Radioactive System

Materials

The materials of construction for subject mechanical components of the Equipment Drains Radioactive System are:

- Glass
- Stainless steel
- Steel

Environments

Subject mechanical components of the Equipment Drains Radioactive System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Concrete
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Equipment Drains Radioactive System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Equipment Drains Radioactive System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Monitoring and Collection Systems Inspection
- Supplemental Piping/Tank Inspection

3.3.2.1.22 Fire Protection System

Materials

The materials of construction for subject mechanical components of the Fire Protection (FP) System are:

- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Glass
- Gray cast iron
- Polymer
- Stainless steel
- Steel

Environments

Subject mechanical components of the FP System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Fuel oil
- Lubricating oil
- Moist air
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the FP System:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of pre-load
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the FP System:

- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- Chemistry Program Effectiveness Inspection
- Diesel-Driven Fire Pumps Inspection
- External Surfaces Monitoring Program
- Fire Protection Program
- Fire Water Program
- Flexible Connection Inspection

- Fuel Oil Chemistry
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection
- Selective Leaching Inspection
- Supplemental Piping/Tank Inspection

3.3.2.1.23 Floor Drain System

Materials

The material of construction for subject mechanical components of the Floor Drain System is:

- Steel

Environments

Subject mechanical components of the Floor Drain System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Concrete
- Moist air
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Floor Drain System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Floor Drain System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Monitoring and Collection Systems Inspection
- Supplemental Piping/Tank Inspection

3.3.2.1.24 Floor Drain Radioactive System

Materials

The materials of construction for subject mechanical components of the Floor Drain Radioactive System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Floor Drain Radioactive System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Concrete
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Floor Drain Radioactive System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Floor Drain Radioactive System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Monitoring and Collection Systems Inspection
- Supplemental Piping/Tank Inspection

3.3.2.1.25 Fuel Pool Cooling System

Materials

The materials of construction for subject mechanical components of the Fuel Pool Cooling System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Fuel Pool Cooling System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Concrete
- Moist air
- Raw water
- Treated Water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Fuel Pool Cooling System:

- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Fuel Pool Cooling System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program

- Heat Exchangers Inspection
- Monitoring and Collection Systems Inspection
- Supplemental Piping/Tank Inspection

3.3.2.1.26 Miscellaneous Waste Radioactive System

Materials

The materials of construction for subject mechanical components of the Miscellaneous Waste Radioactive System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Miscellaneous Waste Radioactive System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Concrete
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Miscellaneous Waste Radioactive System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Miscellaneous Waste Radioactive System:

- Bolting Integrity Program
- Monitoring and Collection Systems Inspection

3.3.2.1.27 Plant Sanitary Drains System

Materials

The material of construction for subject mechanical components of the Plant Sanitary Drains System is:

- Steel

Environments

Subject mechanical components of the Plant Sanitary Drains System are exposed to the following normal operating environments:

- Condensation
- Moist air
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Plant Sanitary Drains System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Plant Sanitary Drains System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Monitoring and Collection Systems Inspection

3.3.2.1.28 Plant Service Water System

Materials

The materials of construction for subject mechanical components of the Plant Service Water System are:

- Gray cast iron
- Stainless steel

- Steel

Environments

Subject mechanical components of the Plant Service Water System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Condensation
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Plant Service Water System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Plant Service Water System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Open-Cycle Cooling Water Program
- Selective Leaching Inspection

3.3.2.1.29 Potable Cold Water System

Materials

The materials of construction for subject mechanical components of the Potable Cold Water System are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Gray cast iron

Environments

Subject mechanical components of the Potable Cold Water System are exposed to the following normal operating environments:

- Condensation
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Potable Cold Water System:

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Potable Cold Water System:

- External Surfaces Monitoring Program
- Potable Water Monitoring Program
- Selective Leaching Inspection

3.3.2.1.30 Potable Hot Water System

Materials

The materials of construction for subject mechanical components of the Potable Hot Water System are:

- Copper alloy
- Copper alloy > 15% Zn

Environments

Subject mechanical components of the Potable Hot Water System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Raw water

Aging Effects Requiring Management

The following aging effect requires management for the subject mechanical components of the Potable Hot Water System:

- Loss of material

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Potable Hot Water System:

- Potable Water Monitoring Program
- Selective Leaching Inspection

3.3.2.1.31 Primary Containment System

Materials

The materials of construction for the subject mechanical components of the Primary Containment System are:

- Stainless steel
- Steel

Environments

The subject mechanical components of the Primary Containment System are exposed to the following normal plant environment:

- Air-indoor uncontrolled

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Primary Containment System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management program manages the aging effects for the subject mechanical components of the Primary Containment System:

- Bolting Integrity Program

3.3.2.1.32 Process Sampling System

Materials

The materials of construction for subject mechanical components of the Process Sampling System are:

- Copper alloy
- Copper alloy > 15% Zn
- Polymer
- Stainless steel
- Steel

Environments

Subject mechanical components of the Process Sampling System are exposed to the following normal operating environments:

- Condensation
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Process Sampling System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Process Sampling System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Open-Cycle Cooling Water Program
- Selective Leaching Inspection

3.3.2.1.33 Process Sampling Radioactive System

Materials

The materials of construction for subject mechanical components of the Process Sampling Radioactive System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Process Sampling Radioactive System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Raw water
- Treated water
- Treated water > 60 ºC (140 ºF)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Process Sampling Radioactive System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Process Sampling Radioactive System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Monitoring and Collection Systems Inspection

- Open-Cycle Cooling Water Program
- Supplemental Piping/Tank Inspection

3.3.2.1.34 Pump House HVAC Systems

Materials

The materials of construction for subject mechanical components of the Pump House HVAC systems are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Stainless steel
- Steel

Environments

Subject mechanical components of the Pump House HVAC systems are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Condensation
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Pump House HVAC systems:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Pump House HVAC systems:

- Bolting Integrity Program
- Cooling Units Inspection
- External Surfaces Monitoring Program
- Open-Cycle Cooling Water Program

3.3.2.1.35 Radwaste Building Chilled Water System

Materials

The materials of construction for subject mechanical components of the Radwaste Building Chilled Water System are:

- Copper alloy
- Copper alloy > 15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Radwaste Building Chilled Water System are exposed to the following normal operating environments:

- Closed cycle cooling water
- Condensation

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Radwaste Building Chilled Water System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Radwaste Building Chilled Water System:

- Bolting Integrity Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Selective Leaching Inspection

3.3.2.1.36 Radwaste Building HVAC Systems

Materials

The materials of construction for subject mechanical components of the Radwaste Building HVAC systems are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Stainless steel
- Steel

Environments

Subject mechanical components of the Radwaste Building HVAC systems are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Condensation
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Radwaste Building HVAC systems:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Radwaste Building HVAC systems:

- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- Cooling Units Inspection
- External Surfaces Monitoring Program
- Heat Exchangers Inspection
- Open-Cycle Cooling Water Program
- Selective Leaching Inspection

3.3.2.1.37 Reactor Building HVAC Systems

Materials

The materials of construction for subject mechanical components of the Reactor Building HVAC systems are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Gray cast iron

- Stainless steel
- Steel

Environments

Subject mechanical components of the Reactor Building HVAC systems are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Condensation
- Moist air
- Raw water
- Steam

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Reactor Building HVAC systems:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Reactor Building HVAC systems:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Cooling Units Inspection
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion (FAC) Program
- Open-Cycle Cooling Water Program

- Potable Water Monitoring Program
- Selective Leaching Inspection
- Supplemental Piping/Tank Inspection

3.3.2.1.38 Reactor Closed Cooling Water System

Materials

The materials of construction for subject mechanical components of the Reactor Closed Cooling Water System are:

- Glass
- Stainless steel
- Steel

Environments

Subject mechanical components of the Reactor Closed Cooling Water System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Closed cycle cooling water > 60 ºC (140 ºF)
- Moist air
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Reactor Closed Cooling Water System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Reactor Closed Cooling Water System:

- Bolting Integrity Program
- Chemistry Program Effectiveness Inspection

- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Monitoring and Collection Systems Inspection
- Open-Cycle Cooling Water Program
- Supplemental Piping/Tank Inspection

3.3.2.1.39 Reactor Water Cleanup System

Materials

The materials of construction for subject mechanical components of the Reactor Water Cleanup System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Reactor Water Cleanup System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Closed cycle cooling water > 60 ºC (140 ºF)
- Treated water
- Treated water > 60 ºC (140 ºF)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Reactor Water Cleanup System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Reactor Water Cleanup System:

- Bolting Integrity Program

- BWR Stress Corrosion Cracking Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Flow Accelerated Corrosion (FAC) Program

3.3.2.1.40 Service Air System

Materials

The material of construction for subject mechanical components of the Service Air System is:

- Steel

Environments

Subject mechanical components of the Service Air System are exposed to the following normal operating environments:

- Air
- Air-indoor uncontrolled

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Service Air System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Service Air System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Service Air System Inspection

3.3.2.1.41 Standby Liquid Control System

Materials

The materials of construction for subject mechanical components of the Standby Liquid Control (SLC) System are:

- Cast austenitic stainless steel
- Polymer
- Stainless steel
- Steel

Environments

Subject mechanical components of the SLC System are exposed to the following normal operating environments:

- Air
- Air-indoor uncontrolled
- Moist air
- Sodium pentaborate solution
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the SLC System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the SLC System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Supplemental Piping/Tank Inspection

3.3.2.1.42 Standby Service Water System

Materials

The materials of construction for subject mechanical components of the Standby Service Water System are:

- Copper alloy
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Standby Service Water System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Condensation
- Lubricating oil
- Moist air
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Standby Service Water System:

- Cracking
- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Standby Service Water System:

- Bolting Integrity Program

- Buried Piping and Tanks Inspection Program
- External Surfaces Monitoring Program
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection
- Open-Cycle Cooling Water Program
- Selective Leaching Inspection
- Supplemental Piping/Tank Inspection

3.3.2.1.43 Tower Makeup Water System

Materials

The materials of construction for subject mechanical components of the Tower Makeup Water System are:

- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Tower Makeup Water System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Condensation
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Tower Makeup Water System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Tower Makeup Water System:

- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- External Surfaces Monitoring Program
- Open-Cycle Cooling Water Program
- Selective Leaching Inspection
- Supplemental Piping/Tank Inspection

3.3.2.1.44 Traversing Incore Probe System

Materials

The materials of construction for subject mechanical components of the Traversing Incore Probe System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Traversing Incore Probe System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Gas

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Traversing Incore Probe System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management program manages the aging effects for subject mechanical components of the Traversing Incore Probe System:

- Bolting Integrity Program

- External Surfaces Monitoring Program

3.3.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

For the Auxiliary Systems, those items requiring further evaluation are addressed in the following sections.

3.3.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis, as defined in 10 CFR 54.3. Time-limited aging analyses are required to be evaluated in accordance with 10 CFR 54.21(c). Time-limited aging analyses identified for fatigue in the Auxiliary Systems are evaluated in Section 4.3.4.

3.3.2.2.2 Reduction of Heat Transfer due to Fouling

As described in Table 3.3.1, the Fuel Pool Cooling System has stainless steel heat exchanger tubes in treated water which are evaluated under item number 3.3.1-03. Fouling of stainless steel heat exchanger tubes in treated water is managed by the BWR Water Chemistry Program, in conjunction with the Heat Exchangers Inspection.

3.3.2.2.3 Cracking due to Stress Corrosion Cracking (SCC)

3.3.2.2.3.1 BWR Standby Liquid Control System

The treated water environment for the Standby Liquid Control System uses an aqueous solution of sodium pentaborate decahydrate. The system is normally in standby with the fluid temperature maintained above the 60ºF saturation temperature in an area where the ambient temperature is less than 100ºF during normal plant operation. Since the temperature is below 140ºF during normal plant operation, cracking due to SCC is not an aging effect requiring management for the stainless steel components of the Standby Liquid Control System.

3.3.2.2.3.2 Heat Exchanger Components

As described in Table 3.3.1, there are no components compared to item number 3.3.1-05. The Reactor Water Cleanup regenerative and non-regenerative heat exchangers at Columbia have no stainless steel components subject to AMR. Therefore, cracking of these components due to stress corrosion cracking is not an aging effect requiring management. Refer to item 3.3.1-48 (no further evaluation required) for the aging effects that do require management for these components.

3.3.2.2.3.3 Diesel Engine Exhaust Piping, Piping Components, and Piping Elements

During normal plant operations, diesel exhaust piping, piping components, and piping elements are exposed to diesel exhaust infrequently and for short durations. For the remaining time, these components are exposed internally to outdoor air. As such, temperatures above 140ºF occur only infrequently and for short durations. Therefore, cracking due to SCC is not identified as an aging effect requiring management for stainless steel diesel engine exhaust components. In addition, with the exception of the flexible connection for the HPCS diesel compressor, diesel exhaust piping, piping components, and piping elements are steel, for which cracking due to SCC is not an applicable aging effect.

3.3.2.2.4 Cracking due to Stress Corrosion Cracking and Cyclic Loading

The associated items in Table 3.3.1 (including 3.3.2.2.4.1, 3.3.2.2.4.2, 3.3.2.2.4.3, and 3.3.2.2.4.4) are applicable to PWRs only.

3.3.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

3.3.2.2.5.1 Components of Heating and Ventilation Systems

The HVAC systems contain elastomer flexible connections and elastomer mechanical sealants requiring aging management based on plant operating experience. Elastomer flexible connections and elastomer mechanical sealants subject to hardening and loss of strength in HVAC systems are managed by the External Surfaces Monitoring Program.

3.3.2.2.5.2 Spent Fuel Cooling and Cleanup Systems

There are no elastomer linings in the Fuel Pool Cooling System that are subject to AMR.

Elastomer flexible connections in the Diesel Cooling Water System refer to Table 3.3.1 item 3.3.1-12. Hardening and loss of strength of these flexible connections is managed by the Flexible Connection Inspection, which is a new one-time inspection to detect and characterize aging of these connections.

3.3.2.2.6 Reduction of Neutron-Absorbing Capacity and Loss of Material due to General Corrosion

The spent fuel racks contain a neutron-absorbing medium of boron carbide (B_4C) granular material bonded together to form plates. These plates are sealed in a stainless steel rack and are not exposed to treated water. Consequently, there are no aging effects requiring management for the neutron absorber material. The stainless steel around the neutron absorber is exposed to treated water and is susceptible to loss of material due to crevice and pitting corrosion. The BWR Water Chemistry Program is credited for aging management.

3.3.2.2.7 Loss of Material due to General, Pitting, and Crevice Corrosion

3.3.2.2.7.1 Reactor Coolant Pump Oil Collection System

Columbia does not have a reactor coolant pump (reactor recirculation pump) oil collection system. Other components exposed to lubricating oil have loss of material mitigated by the Lubricating Oil Analysis Program with the Lubricating Oil Inspection verifying the effectiveness of the program.

3.3.2.2.7.2 BWR Reactor Water Cleanup and Shutdown Cooling Systems

Loss of material due to general, pitting, and crevice corrosion for steel piping components, accumulators, tanks, and heat exchanger components exposed to treated water is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components, accumulators, tanks, and heat exchanger components.

The one exception is the Equipment Drains Radioactive System, for which loss of material for piping and piping components with a structural integrity function is managed by the Monitoring and Collection Systems Inspection, which is a new one-time inspection that will detect and characterize loss of material.

3.3.2.2.7.3 Diesel Exhaust Piping, Piping Components, and Piping Elements

During normal plant operations, diesel exhaust piping, piping components, and piping elements are exposed to diesel exhaust gases infrequently and for short durations. For the remaining time, these components are exposed internally to outdoor air. The configuration of the diesel exhaust has the potential for collection of moisture inside the piping, piping components, and piping elements. With the combination of this potential for moisture collection and the infrequent exposure to diesel exhaust gases, loss of material due to crevice, general and pitting corrosion is an aging effect requiring management for steel (exhaust) piping exposed internally to outdoor air. This loss of material is managed by the Diesel Systems Inspection or the Diesel-Driven Fire Pumps Inspection, which are new one-time inspections that will detect and characterize loss of material on the internal surface of diesel exhaust piping, piping components, and piping elements.

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, and crevice corrosion and microbiologically-influenced corrosion (MIC) for steel piping components, and the steel diesel fuel oil storage tank, with coatings buried in soil is managed by the Buried Piping and Tanks Inspection Program.

3.3.2.2.9 Loss of Material due to General, Pitting, Crevice, Microbiologically Influenced Corrosion, and Fouling

3.3.2.2.9.1 Piping, Piping Components, and Piping Elements – Fuel Oil

Loss of material due to general, pitting, and crevice corrosion and MIC for steel piping components and tanks exposed to fuel oil is managed by the Fuel Oil Chemistry Program. The Fuel Oil Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the Fuel Oil Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components and tanks exposed to fuel oil. Fouling is not identified as an aging effect for fuel oil.

3.3.2.2.9.2 Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material due to general, pitting, and crevice corrosion and microbiologically-influenced corrosion (MIC) for steel piping components, heat exchanger components, gear units, and tanks exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to general, pitting, and crevice corrosion and MIC through examination of steel piping components, heat exchanger components, gear units, and tanks.

3.3.2.2.10 Loss of Material due to Pitting and Crevice Corrosion

3.3.2.2.10.1 Steel Piping with Elastomer Lining or Stainless Steel Cladding

There is no steel piping with elastomer lining or stainless steel cladding subject to AMR in the Auxiliary systems.

3.3.2.2.10.2 Piping, Piping Components, Piping Elements, and Heat Exchanger Components

Loss of material due to pitting and crevice corrosion for stainless steel heat exchanger components and stainless steel piping components exposed to treated water is managed by the BWR Water Chemistry Program. Additionally, loss of material for stainless steel spent fuel pool gates, storage racks, and storage rack neutron absorber sheathing exposed to treated water is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material through examination of stainless steel heat exchanger, piping, spent fuel pool gates, and spent fuel storage racks components.

Loss of material for the spent fuel storage rack stainless steel coverings over the boron carbide absorbers is managed by the BWR Water Chemistry Program alone. As these stainless steel plates are not in low flow or stagnant flow areas, one-time inspection is not required.

Loss of material due to pitting and crevice corrosion for components in the Process Sampling Radioactive and Equipment Drains Radioactive systems that are not submerged within the suppression pool is managed by the Monitoring and Collection Systems Inspection, which will detect and characterize loss of material.

There are no aluminum components subject to AMR in the Auxiliary systems that are exposed to treated water.

3.3.2.2.10.3 HVAC Piping, Piping Components, and Piping Elements

The Open-Cycle Cooling Water Program is credited with the management of loss of material for copper alloy heat exchanger tubes exposed to external condensation. The Cooling Units Inspection is a one-time inspection that will detect and characterize loss of material due to pitting and crevice corrosion for copper alloy HVAC heat exchanger tubes in an external environment with potential for wetting. Loss of material for copper alloy piping and in-line components is managed by the External Surfaces Monitoring Program.

3.3.2.2.10.4 Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material due to pitting and crevice corrosion for copper alloy piping components exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. Loss of material for copper alloy heat exchanger components exposed to lubricating oil is also managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to pitting and crevice corrosion through examination of copper alloy piping and heat exchanger components. Copper alloys with less than 15% zinc and less than 8% aluminum are not susceptible to loss of material due to pitting or crevice corrosion and do not require management.

3.3.2.2.10.5 HVAC Piping, Piping Components, and Piping Elements and Ducting

Loss of material for aluminum and stainless steel piping and piping components, heat exchanger components, tanks, and drain pans exposed to condensation is managed by the Cooling Units Inspection, the Open-Cycle Cooling Water Program, or the External Surfaces Monitoring Program. The Cooling Units Inspection is a one-time inspection that will detect and characterize loss of material for these components.

3.3.2.2.10.6 Fire Protection System

Loss of material due to pitting and crevice corrosion is an applicable aging effect only if the materials are exposed to an aggressive environment. The only copper or copper alloy fire protection system piping components exposed to internal ambient environments are spray nozzles, strainers bodies, and valve bodies. The components are open to local ambient air conditions such that condensation will not occur and are not subject to continuous wetting or alternate wetting and drying that would constitute an aggressive environment. Therefore, loss of material due to pitting and crevice corrosion is not an aging effect requiring management for these components.

3.3.2.2.10.7 Stainless Steel Piping, Piping Components, and Piping Elements - Soil

As described in Table 3.3.1, there are no components compared to item number 3.3.1-29. There is no stainless steel piping subject to AMR for Columbia that is exposed to soil in the Auxiliary systems.

3.3.2.2.10.8 BWR Standby Liquid Control System

Loss of material due to pitting and crevice corrosion for stainless steel piping components and tanks exposed to sodium pentaborate solution is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to pitting and crevice corrosion through examination of stainless steel piping components and tanks exposed to sodium pentaborate solution.

3.3.2.2.11 Loss of Material due to Pitting, Crevice, and Galvanic Corrosion

As described in Table 3.3.1, there were no components compared to item number 3.3.1-31. There are no copper alloy piping, piping components, or piping elements in the Auxiliary systems that are exposed to treated water.

3.3.2.2.12 Loss of Material due to Pitting, Crevice, and Microbiologically Influenced Corrosion

3.3.2.2.12.1 Piping, Piping Components, and Piping Elements – Fuel Oil

There are no aluminum piping components exposed to fuel oil that are subject to AMR.

Loss of material due to pitting and crevice corrosion and MIC for stainless steel and copper alloy piping components exposed to fuel oil is managed by the Fuel Oil Chemistry Program. The Fuel Oil Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the Fuel Oil Chemistry Program to manage loss of material through examination of piping and components exposed to fuel oil.

3.3.2.2.12.2 Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material due to pitting and crevice corrosion and MIC for stainless steel piping components and heat exchanger components exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the

Lubricating Oil Analysis Program to manage loss of material due to pitting and crevice corrosion and MIC through examination of stainless steel piping and heat exchanger components.

3.3.2.2.13 Loss of Material due to Wear

Wear of elastomer seals and components exposed to air was not identified as an aging effect requiring management. Loss of material due to wear is the result of relative motion between two surfaces in contact. However, wear occurs during the performance of an active function; as a result of improper design, application, or operation; or to a very small degree with insignificant consequences. Therefore, loss of material due to wear is not an aging effect requiring management for elastomers exposed to air-indoor uncontrolled.

3.3.2.2.14 Loss of Material due to Cladding Breach

The associated items in Table 3.3.1 are applicable to PWRs only.

3.3.2.2.15 Quality Assurance for Aging Management of Non-safety Related Components

Quality Assurance provisions applicable to license renewal are discussed in Appendix B, Section B.1.3.

3.3.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the components of the Auxiliary Systems. The section of the application that contains the time-limited aging analysis review results is indicated in parentheses.

- Metal Fatigue (Section 4.3, Metal Fatigue)

3.3.3 Conclusions

The Auxiliary System components and commodities having aging effects requiring management have been evaluated, and aging management programs have been selected to manage the aging effects. A description of the aging management programs is provided in Appendix B, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging will be adequately managed so that there is reasonable assurance that the intended functions of Auxiliary System components and commodities will be maintained consistent with the current licensing basis, and that spatial interactions will not result in the loss of any safety-related intended functions, during the period of extended operation.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-01	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	Not applicable. Crane load cycles are not a TLAA.
3.3.1-02	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. Refer to Section 3.3.2.2.1 for further information.
3.3.1-03	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 BWR Water Chemistry Program, in conjunction with the Heat Exchangers Inspection, is credited to manage reduction in heat transfer for stainless steel heat exchanger tubes that are exposed to treated water. Refer to Section 3.3.2.2.2 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-04	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 normal operating temperature of the Standby Liquid Control System is below 140 °F; therefore, cracking due to SCC is not an aging effect requiring management. Refer to Section 3.3.2.2.3.1 for further information.
3.3.1-05	Stainless steel and stainless clad steel heat exchanger components exposed to treated water >60 °C (>140 °F)	Cracking due to stress corrosion cracking	A plant specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. There are no stainless steel and stainless clad steel heat exchanger components in the auxiliary systems that are exposed to treated water >60 °C (>140 °F). Refer to Section 3.3.2.2.3.2 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-06	Stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust	Cracking due to stress corrosion cracking	A plant specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. As described in LRA Tables 3.3.2-16 and 3.3.2-22, exhaust piping, piping components and piping elements are steel. Refer to Section 3.3.2.2.3.3 for further information.
3.3.1-07	PWR Only				
3.3.1-08	PWR Only				
3.3.1-09	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. This item only applies to bolting for components addressed in items 3.3.1-07, 3.3.1-08, and 3.3.1-09 above, which are for a PWR only. Refer to Section 3.3.2.2.4 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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	A plant specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. The Flexible Connection Inspection is credited to detect and characterize hardening and loss of strength for elastomers in the auxiliary systems, except for HVAC systems. For HVAC system elastomers (flexible connections and mechanical sealants), the External Surfaces Monitoring Program is credited. During normal plant operations, elastomer components in the Diesel (Engine) Exhaust System and the Diesel Lubricating Oil System are not exposed to high temperatures, radiation or ozone; therefore, no aging effects were identified as requiring management for the air – indoor uncontrolled environment. For these cases, a Note I is applied. Refer to Section 3.3.2.2.5.1 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Although there is no elastomer lining exposed to treated water or treated borated water, this item is applied to flexible connections in the Diesel Cooling Water System. The Flexible Connection Inspection is credited to detect and characterize hardening and loss of strength for these elastomer components. Refer to Section 3.3.2.2.5.2 for further information.
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	A plant specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. The spent fuel storage racks contain a neutron-absorbing medium of boron carbide (B_4C) granular material bonded together to form plates. These plates are sealed in a stainless steel rack and are not exposed to treated water. Refer to Section 3.3.2.2.6 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**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	Consistent with NUREG-1801. The Lubricating Oil Analysis Program, in conjunction with the Lubricating Oil Inspection, is credited to manage loss of material for steel piping, piping component, and piping elements that are exposed to lubricating oil. This item is also applied to steel gear units and tanks that are exposed to lubricating oil. A Note C is applied. Refer to Section 3.3.2.2.9.2 for further information.
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. There is no reactor coolant pump oil collection system. Refer to Section 3.3.2.2.7.1 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-16	Steel reactor coolant pump oil collection system tank exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection to evaluate the thickness of the lower portion of the tank	Yes, detection of aging effects is to be evaluated	Not applicable. There is no reactor coolant pump oil collection system. Refer to Section 3.3.2.2.7.1 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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 BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for steel piping, piping components, and piping elements in the auxiliary systems that are exposed to treated water. In the Equipment Drains Radioactive System, the Monitoring and Collection Systems Inspection is credited for piping and piping components with a structural integrity function. A Note E is applied. This item is also applied to accumulators, tanks, and heat exchanger components. A Note C is applied. Refer to Section 3.3.2.2.7.2 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	A plant specific aging management program is to be evaluated.	Yes, plant specific	Steel diesel engine exhaust piping, piping components, and piping elements were evaluated as being exposed to diesel exhaust infrequently, and for short durations, and to outdoor air the remainder of the time. The Diesel Systems Inspection or the Diesel-Driven Fire Pumps Inspection is credited. A Note E is applied. Refer to Section 3.3.2.2.7.3 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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	Not applicable. The Buried Piping and Tanks Surveillance is not credited to provide aging management. Consistent with NUREG-1801. The Buried Piping and Tanks Inspection Program is credited to manage loss of material for steel piping (with or without coating or wrapping), piping components, and piping elements in the auxiliary systems that are exposed to soil. This item is also applied to the steel diesel fuel oil storage tank. Refer to Section 3.3.2.2.8 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801, with exceptions. The Fuel Oil Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for steel piping, piping components, piping elements, and tanks in the auxiliary systems that are exposed to fuel oil. Refer to Section 3.3.2.2.9.1 for further information.
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	Consistent with NUREG-1801. The Lubricating Oil Analysis Program, in conjunction with the Lubricating Oil Inspection, is credited to manage loss of material for steel heat exchanger components in the auxiliary systems that are exposed to lubricating oil. Refer to Section 3.3.2.2.9.2 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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. There are no steel with elastomer lining or with stainless steel cladding piping, piping components, or piping elements in the auxiliary systems that are exposed to treated water or treated borated water. Refer to Section 3.3.2.2.10.1 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for stainless steel heat exchanger components in the auxiliary systems that are exposed to treated water. This item is also applied to stainless steel heat exchanger components in the reactor coolant pressure boundary that are exposed to treated water. Refer to Table 3.1.2-3. There are no steel with stainless steel cladding heat exchanger components in the auxiliary systems that are exposed to treated water. Refer to Section 3.3.2.2.10.2 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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 BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for stainless steel piping, piping components, and piping elements in the auxiliary systems exposed to treated water. This item is also applied to accumulators, bolting, and tank screens in the auxiliary systems exposed to treated water. A Note C is applied. This item is also applied to spent fuel pool gates, storage racks, and storage rack neutron absorber sheathing in the Reactor Building exposed to treated water. The BWR Water Chemistry Program alone is credited for these components. A Note C is applied. See associated Table 3.5.2-2 notes for discussion.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-24 (cont'd)					This item is also applied to stainless steel piping, piping components, and piping elements in the Equipment Drains Radioactive and Process Sampling Radioactive systems, for which the Monitoring and Collection Systems Inspection is credited. A Note E is applied. Refer to Section 3.3.2.2.10.2 for further information. Refer also to Table 3.5.2-2.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801. Except as noted below, the External Surfaces Monitoring Program is credited to manage loss of material for copper alloy piping and piping components in the auxiliary systems exposed to condensation (external). For copper alloy heat exchanger components exposed to condensation (external), the Open-Cycle Cooling Water Program is credited, if the internal environment is open-cycle cooling water. Otherwise, the Cooling Units Inspection will detect and characterize loss of material. Refer to Section 3.3.2.2.10.3 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801. The Lubricating Oil Analysis Program, in conjunction with the Lubricating Oil Inspection, is credited to manage loss of material for copper alloy piping, piping components, and piping elements in the auxiliary systems that are exposed to lubricating oil, but only if the zinc content is greater than 15%. Otherwise, a Note I is applied. This item is also applied to copper alloy heat exchanger components with zinc content greater than 15% that are exposed to lubricating oil. A Note C is applied. Refer to Section 3.3.2.2.10.4 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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	Consistent with NUREG-1801. Except as noted, the External Surfaces Monitoring Program is credited to manage loss of material for stainless steel piping, piping components, piping elements and aluminum tanks and heat exchanger components (shells and tubes) in the auxiliary systems exposed to condensation (external). For aluminum heat exchanger components (cooling unit fins) exposed to condensation (external), the Open-Cycle Cooling Water Program is credited, if the internal environment is open-cycle cooling water. Otherwise, the Cooling Units Inspection will detect and characterize loss of material, including for stainless steel cooling unit drain pans and piping. Refer to Section 3.3.2.2.10.5 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Not applicable. There are no copper alloy fire protection piping, piping components, or piping elements in the auxiliary systems that are exposed to condensation (internal). Refer to Section 3.3.2.2.10.6 for further information.
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 piping, piping components, or piping elements in the auxiliary systems that are exposed to soil. Refer to Section 3.3.2.2.10.7 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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 BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for stainless steel piping, piping components, and piping elements in the Standby Liquid Control (SLC) System that are exposed to sodium pentaborate solution, which is evaluated as a treated water environment. This item is also applied to stainless steel tanks in the SLC System that are exposed to sodium pentaborate solution. A Note C is applied. Refer to Section 3.3.2.2.10.8 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Not applicable. There are no copper alloy piping, piping components, or piping elements in the auxiliary systems that are exposed to treated water. Refer to Section 3.3.2.2.11 for further information.
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	Consistent with NUREG-1801, with exceptions. The Fuel Oil Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for stainless steel and copper alloy piping and piping components in the auxiliary systems that are exposed to fuel oil. There are no aluminum piping, piping components, or piping elements in the auxiliary systems that are exposed to fuel oil. Refer to Section 3.3.2.2.12.1 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Consistent with NUREG-1801. The Lubricating Oil Analysis Program, in conjunction with the Lubricating Oil Inspection, is credited to manage loss of material for stainless steel piping, piping components, and piping elements in the auxiliary systems that are exposed to lubricating oil. This item is also applied to heat exchanger components that are exposed to lubricating oil. A Note C is applied. Refer to Section 3.3.2.2.12.2 for further information.
3.3.1-34	Elastomer seals and components exposed to air – indoor uncontrolled (internal or external)	Loss of material due to wear	A plant specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. Loss of material due to wear was not identified as an aging effect requiring management for elastomer seals and components in auxiliary systems exposed to air-indoor uncontrolled. Refer to Section 3.3.2.2.13 for further information.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Not applicable. Boraflex is not used as a neutron absorber in spent fuel storage racks. Refer to Item Number 3.3.1-13.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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	Except as noted below, the BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage cracking for stainless steel piping, piping components, and piping elements in the auxiliary systems that are exposed to treated water >60 °C (>140 °F). A Note E is applied. For stainless steel orifices and thermal sleeves that are exposed to treated water >60 °C (>140 °F) in the Reactor Water Cleanup System, the BWR Stress Corrosion Cracking Program is credited to manage cracking instead of the BWR Water Chemistry Program. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-37 (cont'd)					For stainless steel piping, piping components, and piping elements that are exposed to treated water >60 °C (>140 °F) in the Process Sampling Radioactive System, the Monitoring and Collection Systems Inspection is credited. A Note E is applied.
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 BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage cracking for stainless steel piping, piping components, and piping elements in the auxiliary systems that are exposed to treated water >60 °C (>140 °F). A Note E is applied where the Chemistry Program Effectiveness Inspection is credited instead of the BWR Stress Corrosion Cracking Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 BWR spent fuel storage racks that are exposed to treated water >60 °C (>140 °F). The spent fuel pool is maintained below 140 °F.
3.3.1-40	Steel tanks in diesel fuel oil system exposed to air - outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Steel tanks in the Diesel Fuel Oil System are buried, and not exposed to air-outdoor (external). However, this item is applied to the internal surface of the fuel oil tanks that are evaluated as exposed to ambient air, i.e., air-outdoor (internal). The External Surfaces Monitoring Program is credited to manage loss of material. A Note E is applied.
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. There is no high-strength steel closure bolting in the auxiliary systems that is exposed to air with steam or water leakage.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Not applicable. There is no steel closure bolting in the auxiliary systems that is exposed to air with steam or water leakage.
3.3.1-43	Steel bolting and closure bolting exposed to air – indoor uncontrolled (external) or air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. The Bolting Integrity Program is credited to manage loss of material for steel bolting in the auxiliary systems that is exposed to air-indoor uncontrolled (external) or air-outdoor (external).
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	Consistent with NUREG-1801, with exceptions. Steel compressed air system bolting is not exposed to condensation. However, this item is also applied to bolting in other auxiliary systems where exposure to condensation has been identified. The Bolting Integrity Program is credited to manage loss of material.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**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	Consistent with NUREG-1801, with exceptions. The Bolting Integrity Program is credited to manage loss of pre-load for steel bolting in the auxiliary systems that is exposed to air-indoor uncontrolled (external) and air-outdoor (external).

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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, with exceptions. The Closed Cooling Water Chemistry Program is credited to manage cracking for stainless steel piping components in the auxiliary systems that are exposed to closed cycle cooling water >60 °C (>140 °F). Additionally, the Chemistry Program Effectiveness Inspection is credited to verify the effectiveness of the Closed Cooling Water Chemistry Program. A Note E is applied. There are no stainless clad steel piping, piping components, piping elements, or heat exchanger components in the auxiliary systems that are exposed to closed cycle cooling water >60 °C (>140 °F).

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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, with exceptions. The Closed Cooling Water Chemistry Program is credited to manage loss of material for steel piping, piping components, piping elements, and tanks in the auxiliary systems that are exposed to closed cycle cooling water. Additionally, the Chemistry Program Effectiveness Inspection is credited to verify the effectiveness of the Closed Cooling Water Chemistry Program. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, with exceptions. The Closed Cooling Water Chemistry Program is credited to manage loss of material for steel heat exchanger components in the auxiliary systems that are exposed to closed cycle cooling water. Additionally, the Chemistry Program Effectiveness Inspection is credited to verify the effectiveness of the Closed Cooling Water Chemistry Program. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-49	Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water	Loss of material due to microbiologically influenced corrosion	Closed-Cycle Cooling Water System	No	Not applicable. Loss of material due to microbiologically influenced corrosion is not an aging effect requiring management for stainless steel heat exchanger components in the auxiliary systems that are exposed to closed cycle cooling water. Additionally, there are no steel with stainless steel cladding heat exchanger components in the auxiliary systems that are exposed to closed cycle cooling water.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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, with exceptions. The Closed Cooling Water Chemistry Program is credited to manage loss of material for stainless steel piping, piping components, and piping elements in the auxiliary systems that are exposed to closed cycle cooling water. This item is also applied to stainless steel heat exchanger components that are exposed to closed cycle cooling water. A Note D is applied. Additionally, the Chemistry Program Effectiveness Inspection is credited to verify the effectiveness of the Closed Cooling Water Chemistry Program. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, with exceptions. The Closed Cooling Water Chemistry Program is credited to manage loss of material for copper alloy piping, piping components, piping elements, and heat exchanger components in the auxiliary systems that are exposed to closed cycle cooling water. Additionally, the Chemistry Program Effectiveness Inspection is credited to verify the effectiveness of the Closed Cooling Water Chemistry Program. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-52	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. The Closed Cooling Water Chemistry Program is credited to manage reduction in heat transfer for stainless steel and copper alloy heat exchanger tubes in the auxiliary systems that are exposed to closed cycle cooling water. Additionally, the Heat Exchangers Inspection is credited to verify the effectiveness of the Closed Cooling Water Chemistry Program. A Note E is applied. A heat exchanger in the reactor coolant pressure boundary is also compared to this item, crediting the same combination of programs.
3.3.1-53	Steel compressed air system piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to general and pitting corrosion	Compressed Air Monitoring	No	Not applicable. Steel compressed air system piping, piping components, and piping elements are not exposed to condensation (internal).

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-54	Stainless steel compressed air system piping, piping components, and piping elements exposed to internal condensation	Loss of material due to pitting and crevice corrosion	Compressed Air Monitoring	No	Stainless steel compressed air system piping, piping components, and piping elements are not exposed to internal condensation. However, this item is applied to stainless steel piping and tanks in other auxiliary systems that are exposed to moist air (internal). The Supplemental Piping/Tank Inspection is credited to detect and characterize loss of material. A Note E is applied.
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	Not applicable. Loss of material for steel bolting exposed to air-indoor uncontrolled (external) in the auxiliary systems is managed by the Bolting Integrity Program and addressed in Item Number 3.3.1-43.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-56	Steel HVAC ducting and components external surfaces exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The External Surfaces Monitoring Program is credited to manage loss of material for steel HVAC ducting and components external surfaces that are exposed to air-indoor uncontrolled (external). This item is also applied to internal surfaces that are exposed to air-indoor uncontrolled (internal) or air-outdoor (internal) where it was determined that the internal environment is the same as the external environment. A Note C is applied.
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	Not applicable. For all steel piping and components external surfaces in the auxiliary systems that are exposed to air-indoor uncontrolled (external), refer to Item Number 3.3.1-58.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. Except as noted below, the External Surfaces Monitoring Program is credited to manage loss of material for steel surfaces in the auxiliary systems that are exposed to air-indoor uncontrolled (external), air-outdoor (external), and condensation (external). This item is also applied to internal surfaces that are exposed to air-indoor uncontrolled (internal) or air-outdoor (internal) where it was determined that the internal environment is the same as the external environment. A Note C is applied. For steel surfaces that are exposed to an air-water interface in the air-indoor uncontrolled environment, the Supplemental Piping/Tank Inspection is credited. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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 External Surfaces Monitoring Program is credited to manage loss of material for steel heat exchanger components in the auxiliary systems that are exposed to air-indoor uncontrolled (external) or air outdoor (external). This item is also applied to internal surfaces where it was determined that the internal environment is the same as the external environment.
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	Not applicable. For all steel piping and component external surfaces in the auxiliary systems that are exposed to air-outdoor (external), refer to Item Number 3.3.1-58. For steel bolting in the auxiliary systems exposed to air-outdoor (external) refer to Item Number 3.3.1-43.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801, with exceptions. The Fire Protection Program is credited to manage cracking, delamination, separation, and change in material properties for elastomer fire stops that are exposed to air-indoor. Refer to Table 3.5.2-13.
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	This item is applied to aluminum tanks in the Potable Cold Water System that are exposed to raw water. The Potable Water Monitoring Program is credited to manage loss of material. A Note E is applied.
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	Consistent with NUREG-1801, with exceptions. The Fire Protection Program is credited to manage loss of material for steel fire doors that are exposed to air-indoor and air-outdoor. Refer to Table 3.5.2-13.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-64	Steel piping, piping components, and piping elements exposed to fuel oil	Loss of material due to general, pitting, and crevice corrosion	Fire Protection and Fuel Oil Chemistry	No	Consistent with NUREG-1801, with exceptions. The Fire Protection Program and the Fuel Oil Chemistry Program are credited to manage loss of material for steel piping, piping components, and piping elements in the auxiliary systems that are exposed to fuel oil. This item is also applied to tanks that are exposed to fuel oil. A Note D is applied.
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	Not applicable. Cracking and spalling are not aging effects requiring management for reinforced concrete structural fire barriers (walls, ceilings, and floors) that are exposed to air-indoor. Refer to Tables 3.5.2-2, 3.5.2-3, 3.5.2-4, 3.5.2-5, 3.5.2-6, 3.5.2-7, 3.5.2-8, 3.5.2-9, and 3.5.2-10.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Not applicable. Cracking and spalling are not aging effects requiring management for reinforced concrete structural fire barriers (walls, ceilings, and floors) that are exposed to air-outdoor. Refer to Tables 3.5.2-2, 3.5.2-3, 3.5.2-5, 3.5.2-6, 3.5.2-7, 3.5.2-8, 3.5.2-9, and 3.5.2-10.
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	Not applicable. Loss of material is not an aging effect requiring management for reinforced concrete structural fire barriers (walls, ceilings, and floors) that are exposed to air-indoor or air-outdoor. Refer to Tables 3.5.2-2, 3.5.2-3, 3.5.2-4, 3.5.2-5, 3.5.2-6, 3.5.2-7, 3.5.2-8, 3.5.2-9, and 3.5.2-10.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-68	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801. Except as noted below, the Fire Water Program is credited to manage loss of material for steel piping and piping components in the auxiliary systems that are exposed to raw water. This item is also applied to heat exchanger components that are exposed to raw water in the Fire Protection System, for which the Diesel-Driven Fire Pumps Inspection is credited. A Note E is applied. For steel piping and piping components that are exposed to raw water in the Fuel Pool Cooling, Plant Sanitary Drains, and Reactor Closed Cooling Water systems, the Monitoring and Collection Systems Inspection is credited; in the Potable Cold Water System the Potable Water Monitoring Program is credited. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-69	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801. The Fire Water Program is credited to manage loss of material for stainless steel piping, piping components, and piping elements in the Fire Protection System that are exposed to raw water.
3.3.1-70	Copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801. The Fire Water Program is credited to manage loss of material for copper alloy piping, piping components, and piping elements in the Fire Protection System that are exposed to raw water. This item is also applied to copper alloy heat exchanger components in the Fire Protection System that are exposed to raw water. For these components, the Diesel-Driven Fire Pumps Inspection is credited. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-71	Steel piping, piping components, and piping elements exposed to moist air or condensation (Internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	The following programs are credited to manage loss of material for steel piping, piping components, and tanks in the auxiliary systems that are exposed to moist air or condensation (internal): • Cooling Units Inspection for drain piping in HVAC systems exposed to condensation (internal) • Monitoring and Collection Systems Inspection for air-water interfaces in Plant Sanitary Drain System piping evaluated as exposed to moist air (internal) • Supplemental Piping/Tank Inspection for air-water interfaces in piping and tanks evaluated as exposed to moist air (internal) A Note E is applied in each case.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	The Cooling Units Inspection is credited to detect and characterize loss of material for steel drain pans in the Pump House HVAC System that are exposed to condensation (internal). A Note E is applied.
3.3.1-73	Steel crane structural girders in load handling system exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	Consistent with NUREG-1801. The Material Handling System Inspection Program is credited to manage loss of material for steel crane structural girders in the Reactor Building that are exposed to air-indoor. This item is also applied to steel crane rails in the Reactor Building that are exposed to air-indoor. Refer to Table 3.5.2-2.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Not applicable. Loss of material due to wear was not identified as an aging effect requiring management for steel crane rails that are exposed to air-indoor uncontrolled.
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	This item is applied to elastomer components in the Fire Protection System that are exposed to raw water. However, no aging effects requiring management are identified. A Note I is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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, with exceptions. Except as noted below, the Open-Cycle Cooling Water Program is credited to manage loss of material for steel piping, piping components, and piping elements that are exposed to raw water. For steel piping and piping components in the other auxiliary systems that are exposed to raw water, the following programs are credited to manage loss of material: • Diesel Starting Air Inspection for drain piping in Diesel Starting Air System • Diesel Systems Inspection for drain piping in the Diesel (Engine) Exhaust System • Monitoring and Collection Systems Inspection for drain piping in Equipment Drains Radioactive, Floor Drain, and Floor Drain Radioactive systems

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-76 (cont'd)					• Potable Water Monitoring Program for air washers and associated components in the Reactor Building HVAC System A Note E is applied in each case.
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	Consistent with NUREG-1801, with exceptions. Except as noted below, the Open-Cycle Cooling Water Program is credited to manage loss of material for steel heat exchanger components in the auxiliary systems that are exposed to raw water. For steel heat exchanger components that are exposed to raw water in the Equipment Drains Radioactive System, the Monitoring and Collection Systems Inspection is credited. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**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	This item is applied to stainless steel anchors and structural bolting, component and piping supports, and sump liners that are exposed to raw water (refer to Tables 3.5.2-2 and 3.5.2-10). The Inservice Inspection (ISI) Program - IWF is credited to manage loss of material for ASME Class 1, 2, 3, and MC anchor bolts and supports. The Structures Monitoring Program is credited for the other components. A Note E is applied in both cases.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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, with exceptions. Except as noted below, the Open-Cycle Cooling Water Program is credited to manage loss of material for stainless steel piping, piping components, and piping elements in the auxiliary systems that are exposed to raw water. For stainless steel piping, piping components, and piping elements that are exposed to raw (drainage) water in the Equipment Drains Radioactive, Floor Drain Radioactive, Fuel Pool Cooling, Miscellaneous Waste Radioactive, Process Sampling Radioactive, and Reactor Closed Cooling Water systems, the Monitoring and Collection Systems Inspection is credited. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-80	Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Except as noted below, the Open-Cycle Cooling Water Program is credited to manage loss of material for stainless steel and copper alloy heat exchanger components in the auxiliary systems that are exposed to raw water. A Note D is applied. For stainless steel piping that is exposed to raw (drainage) water in the Diesel Starting Air System, the Diesel Starting Air Inspection is credited. A Note E is applied. For stainless steel heat exchanger tubes that are exposed to raw water in the Fire Protection System, the Diesel-Driven Fire Pumps Inspection is credited. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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, with exceptions. Except as noted below, the Open-Cycle Cooling Water Program is credited to manage loss of material for copper alloy piping, piping components, and piping elements in the auxiliary systems that are exposed to raw water. The Potable Water Monitoring Program is credited to manage loss of material for copper alloy piping, piping components, and piping elements that are exposed to raw (potable) water in the Potable Cold Water, Potable Hot Water, and Reactor Building HVAC systems. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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, with exceptions. Except as noted below, the Open-Cycle Cooling Water Program is credited to manage loss of material for copper alloy heat exchanger components in the auxiliary systems that are exposed to raw water. The Diesel-Driven Fire Pumps Inspection is credited to manage loss of material for copper alloy heat exchanger components in the Fire Protection System that are exposed to raw water. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-83	Stainless steel and copper alloy heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Except as noted below, the Open-Cycle Cooling Water Program is credited to manage reduction in heat transfer for stainless steel and copper alloy heat exchanger tubes in the auxiliary systems that are exposed to raw water. The Diesel-Driven Fire Pumps Inspection is credited to detect and characterize reduction in heat transfer for stainless steel and copper alloy heat exchanger tubes in the Fire Protection System that are exposed to raw water. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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 Inspection is credited to detect and characterize loss of material due to selective leaching for copper alloy >15% Zn piping, piping components, piping elements, and heat exchanger components in the auxiliary systems exposed to raw water and closed cycle cooling water.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-85	Gray cast iron piping, piping components, and piping elements exposed to soil, raw water, treated water or closed-cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. The Selective Leaching Inspection is credited to detect and characterize loss of material due to selective leaching for gray cast iron piping, piping components, and piping elements in the auxiliary systems exposed to soil, raw water, and closed-cycle cooling water. This item is also applied to gray cast iron heat exchanger components that are exposed to raw water and closed cycle cooling water, and to gray cast iron tank components exposed to raw water. A Note C is applied.
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	Not applicable. There is no structural steel (new fuel storage rack assembly) exposed to air-indoor uncontrolled (external).
3.3.1-87	PWR Only				
3.3.1-88	PWR Only				
3.3.1-89	PWR Only				

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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. The Columbia AMR process did not take credit for the zinc coating of galvanized steel to prevent the effects of aging on the base metal. Therefore, galvanized steel was evaluated as steel.
3.3.1-93	Glass piping elements exposed to air, air – indoor uncontrolled (external), fuel oil, lubricating oil, raw water, treated water, and treated borated water	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. No aging effects requiring management are identified for glass piping elements in the auxiliary systems that are exposed to air, air-indoor uncontrolled, closed cycle cooling water, lubricating oil, raw water, and treated water.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	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. No aging effects requiring management are identified for stainless steel piping, piping components, and piping elements in the auxiliary systems that are exposed to air-indoor uncontrolled (external). This item is also applied to stainless steel accumulators, bolting, drain pans, duct, screens, and tanks that are exposed to air-indoor uncontrolled (external). A Note C is applied.
3.3.1-95	Steel and aluminum piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. There are no steel or aluminum piping, piping components, or piping elements in the auxiliary systems that are exposed to air-indoor controlled (external). All air-indoor environments were conservatively evaluated as uncontrolled environments.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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. No aging effects requiring management are identified for steel or stainless steel piping, piping components, or piping elements in the auxiliary systems that are exposed to concrete. This item is also applied to steel tank components that are exposed to concrete. A Note C is applied. This item is also applied to steel primary containment vessel inner and outer support skirts, and suppression chamber components that are exposed to concrete. A Note C is applied. Refer to Table 3.5.2-1.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. No aging effects requiring management are identified for steel, stainless steel, aluminum or copper alloy piping, piping components, and piping elements in the auxiliary systems that are exposed to gas. This item is also applied to accumulators, heat exchanger components, and tanks. A Note C is applied.
3.3.1-98	Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. No aging effects requiring management are identified for steel, stainless steel, or copper alloy piping, piping components, and piping elements in the auxiliary systems that are exposed to dried air.
3.3.1-99	PWR Only				

Table 3.3.2-1 Aging Management Review Results – Circulating Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
3	Piping	Pressure boundary	Concrete	Raw water (Internal)	None	None	N/A	N/A	G
4	Piping	Pressure boundary	Concrete	Soil (External)	None	None	II.B1.2-1	3.5.1-2	I 0301
5	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
6	Piping	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
7	Piping	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.C1-18	3.3.1-19	A
8	Rupture Disc	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
9	Rupture Disc	Pressure boundary	Stainless Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B

Table 3.3.2-1 Aging Management Review Results – Circulating Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Valve Body	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
11	Valve Body	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	A
12	Valve Body	Pressure boundary	Gray Cast Iron	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
13	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
14	Valve Body	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A

Table 3.3.2-2 Aging Management Review Results – Condensate Processing Radioactive (Demineralizer) System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
4	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
5	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-3 Aging Management Review Results – Containment Atmosphere Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Heat exchanger (CAC-EV-1A,1B)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
4	Heat exchanger (CAC-EV-1A,1B)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
5	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
6	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
7	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
8	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-3 Aging Management Review Results – Containment Atmosphere Control System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
9	Strainer (body)	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
10	Strainer (body)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
11	Tank (CAC-AW-1A,1B)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
12	Tank (CAC-AW-1A,1B)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
13	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
14	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
15	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
16	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
17	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302

Table 3.3.2-3 Aging Management Review Results – Containment Atmosphere Control System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
18	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-4 Aging Management Review Results – Containment Exhaust Purge and Containment Supply Purge Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Actuator Housing	Pressure boundary	Steel	Dried air (internal)	None	None	VII.J-22	3.3.1-98	A
2	Actuator Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
3	Annubar	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
4	Annubar	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
5	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
6	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
7	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
8	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
9	Damper Housing	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F3-2	3.3.1-56	C 0302

Table 3.3.2-4 Aging Management Review Results – Containment Exhaust Purge and Containment Supply Purge Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Damper Housing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F3-2	3.3.1-56	A
11	Flexible Connection	Pressure boundary	Elastomer	Dried air (Internal)	Hardening and loss of strength	Flexible Connection Inspection	N/A	N/A	H
12	Flexible Connection	Pressure boundary	Elastomer	Gas (Internal)	Hardening and loss of strength	Flexible Connection Inspection	N/A	N/A	H
13	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	Flexible Connection Inspection	VII.F3-7	3.3.1-11	E
14	Flexible Connection	Pressure boundary	Stainless Steel	Dried air (Internal)	None	None	VII.J-18	3.3.1-98	A
15	Flexible Connection	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
16	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
17	Piping	Pressure boundary	Copper Alloy > 15% Zn	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A
18	Piping	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G

Table 3.3.2-4 Aging Management Review Results – Containment Exhaust Purge and Containment Supply Purge Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
19	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
20	Piping	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
21	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
22	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
23	Piping	Pressure boundary	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	A
24	Piping	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
25	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
26	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
27	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-4 Aging Management Review Results – Containment Exhaust Purge and Containment Supply Purge Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Screen (debris)	Filtration	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
29	Tank (CSP-TK-51)	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	C
30	Tank (CSP-TK-51)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
31	Tubing	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
32	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
33	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
34	Valve Body	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
35	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
36	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302

Table 3.3.2-4 Aging Management Review Results – Containment Exhaust Purge and Containment Supply Purge Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
37	Valve Body	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
38	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
39	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
40	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
41	Valve Body (N2 pressure regulator)	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
42	Valve Body (N2 pressure regulator)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-5 Aging Management Review Results – Containment Instrument Air System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Accumulator (MS-TK-3M, 3N, 3P, 3R, 3S, 3U, 3V)	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C 0304
2	Accumulator (MS-TK-3M, 3N, 3P, 3R, 3S, 3U, 3V)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B

Table 3.3.2-5 Aging Management Review Results – Containment Instrument Air System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
6	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
7	Filter Body (Bowl)	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A 0304
8	Filter Body (Bowl)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
9	Filter Body (Head)	Pressure boundary	Gray Cast Iron	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A 0304
10	Filter Body (Head)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
11	Flexible Connection	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A 0304

Table 3.3.2-5 Aging Management Review Results – Containment Instrument Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
12	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
13	Piping	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A 0304
14	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
15	Piping	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A 0304
16	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
17	Piping	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A 0304

Table 3.3.2-5 Aging Management Review Results – Containment Instrument Air System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
18	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
19	Piping	Structural integrity	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A 0304
20	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
21	Pressure Regulator	Pressure boundary	Copper Alloy > 15% Zn	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A 0304
22	Pressure Regulator	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
23	Tubing	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A 0304

Table 3.3.2-5 Aging Management Review Results – Containment Instrument Air System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
24	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
25	Valve Body	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A 0304
26	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
27	Valve Body	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A 0304
28	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
29	Valve Body	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A 0304

Table 3.3.2-5 Aging Management Review Results – Containment Instrument Air System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
30	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
31	Valve Body	Structural integrity	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A 0304
32	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-6 Aging Management Review Results – Containment Monitoring System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	F
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
4	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
5	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
6	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
7	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
8	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
9	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A

Table 3.3.2-6 Aging Management Review Results – Containment Monitoring System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
11	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
12	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
13	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
14	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
15	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-7 Aging Management Review Results – Containment Nitrogen System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	G
5	Heat Exchanger (channel) (CN-VZ-1)	Structural integrity	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	C
6	Heat Exchanger (channel) (CN-VZ-1)	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	N/A	N/A	G
7	Heat Exchanger (channel) (CN-VZ-1)	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	N/A	N/A	G
8	Heat Exchanger (channel) (CN-VZ-1)	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow Accelerated Corrosion (FAC)	N/A	N/A	G

Table 3.3.2-7 Aging Management Review Results – Containment Nitrogen System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
9	Heat Exchanger (channel) (CN-VZ-1)	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.H2-4	3.3.1-59	A
10	Heat Exchanger (shell) (CN-VZ-1)	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	N/A	N/A	G
11	Heat Exchanger (shell) (CN-VZ-1)	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	N/A	N/A	G
12	Heat Exchanger (shell) (CN-VZ-1)	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow Accelerated Corrosion (FAC)	N/A	N/A	G
13	Heat Exchanger (shell) (CN-VZ-1)	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.H2-4	3.3.1-59	A
14	Heat Exchanger (shell) (CN-VZ-3)	Structural integrity	Aluminum	Gas (Internal)	None	None	VII.J-2	3.3.1-97	C
15	Heat Exchanger (shell) (CN-VZ-3)	Structural integrity	Aluminum	Condensation (External)	Cracking	External Surfaces Monitoring	N/A	N/A	F

Table 3.3.2-7 Aging Management Review Results – Containment Nitrogen System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
16	Heat Exchanger (shell) (CN-VZ-3)	Structural integrity	Aluminum	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F4-10	3.3.1-27	E
17	Heat Exchanger (frame) (CN-VZ-2A and 2B)	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.H2-4	3.3.1-59	A
18	Heat Exchanger (tubes) (CN-VZ-2A and 2B)	Structural integrity	Aluminum	Gas (Internal)	None	None	VII.J-2	3.3.1-97	C
19	Heat Exchanger (tubes) (CN-VZ-2A and 2B)	Structural integrity	Aluminum	Condensation (External)	Cracking	External Surfaces Monitoring	N/A	N/A	F
20	Heat Exchanger (tubes) (CN-VZ-2A and 2B)	Structural integrity	Aluminum	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F4-10	3.3.1-27	E
21	Orifice	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
22	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
23	Piping	Structural integrity	Copper Alloy	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A
24	Piping	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F4-12	3.3.1-25	E

Table 3.3.2-7 Aging Management Review Results – Containment Nitrogen System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
25	Piping	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
26	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
27	Piping	Structural integrity	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
28	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
29	Tank (CN-TK-1)	Structural integrity	Steel	Air (Internal)	Loss of material	External Surfaces Monitoring	N/A	N/A	G 0323
30	Tank (CN-TK-1)	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
31	Tank (CN-TK-2)	Structural integrity	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	C
32	Tank (CN-TK-2)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
33	Tubing	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
34	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
35	Tubing	Structural integrity	Copper Alloy	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A

Table 3.3.2-7 Aging Management Review Results – Containment Nitrogen System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
36	Tubing	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F4-12	3.3.1-25	E
37	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A
38	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F4-12	3.3.1-25	E
39	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
40	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A
41	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F4-12	3.3.1-25	E
42	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
43	Valve Body	Structural integrity	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
44	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-8 Aging Management Review Results – Containment Return Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F3-2	3.3.1-56	C 0302
4	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F3-2	3.3.1-56	A
5	Fan Housing (CRA-FN-3A, 3B, 3C, 4A, 4B, 5A, 5B, 5C, 5D)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F3-2	3.3.1-56	C 0302
6	Fan Housing (CRA-FN-3A, 3B, 3C, 4A, 4B, 5A, 5B, 5C, 5D)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F3-2	3.3.1-56	A

Table 3.3.2-9	Aging Management Review Results – Containment Vacuum Breaker System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
4	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
5	Piping	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
6	Piping	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
7	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
8	Piping	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.H2-21	3.3.1-71	E 0303

Table 3.3.2-9 Aging Management Review Results – Containment Vacuum Breaker System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
9	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
10	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
11	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
12	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	VII.I-8	3.3.1-58	E 0303
13	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
14	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
15	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
16	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-10 Aging Management Review Results – Control Air System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Piping	Pressure boundary	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	A 0310

Table 3.3.2-10 Aging Management Review Results – Control Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
6	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
7	Piping	Structural integrity	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	A 0310
8	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
9	Valve Body	Pressure boundary	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	A 0310
10	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
11	Valve Body	Structural integrity	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	A 0310

Table 3.3.2-10 Aging Management Review Results – Control Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
12	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Accumulator (CRD-TK-125/*)	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C
2	Accumulator (CRD-TK-125/*)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	C
3	Accumulator (CRD-TK-125/*)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	C
4	Accumulator (CRD-TK-125/*)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
5	Accumulator (CRD-TK-125/*)	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	C
6	Accumulator (CRD-TK-125/*)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	C
7	Accumulator (CRD-TK-125/*)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	C
8	Accumulator (CRD-TK-125/*)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
9	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
11	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
12	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
13	Filter Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
14	Filter Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
15	Filter Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
16	Filter Body	Structural integrity	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.C2-13	3.3.1-14	A 0308
17	Filter Body	Structural integrity	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.C2-13	3.3.1-14	A
18	Filter Body	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
19	Filter Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
20	Filter Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
21	Filter Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
22	Filter Body	Structural integrity	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.C2-13	3.3.1-14	A
23	Filter Body	Structural integrity	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.C2-13	3.3.1-14	A
24	Filter Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
25	Filter Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
26	Filter Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
27	Flow Element (inline)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
28	Flow Element (inline)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
29	Flow Element (inline)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
30	Gear Unit (CRD-GB-P1A/1A, P1B/1B)	Structural integrity	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.C2-13	3.3.1-14	C 0308
31	Gear Unit (CRD-GB-P1A/1A, P1B/1B)	Structural integrity	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.C2-13	3.3.1-14	C
32	Gear Unit (CRD-GB-P1A/1A, P1B/1B)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
33	Heat Exchanger (channel) (CRD-HX-2A, 2B)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E3-4	3.3.1-48	B
34	Heat Exchanger (channel) (CRD-HX-2A, 2B)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-4	3.3.1-48	E

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
35	Heat Exchanger (channel) (CRD-HX-2A, 2B)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.C2-8	3.3.1-85	C
36	Heat Exchanger (channel) (CRD-HX-2A, 2B)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
37	Heat Exchanger (shell) (CRD-HX-2A, 2B)	Structural integrity	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.C2-5	3.3.1-26	C 0308
38	Heat Exchanger (shell) (CRD-HX-2A, 2B)	Structural integrity	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.C2-5	3.3.1-26	C
39	Heat Exchanger (shell) (CRD-HX-2A, 2B)	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
40	Heat Exchanger (channel) (CRD Pump Bearing Cooler)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E3-4	3.3.1-48	B

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
41	Heat Exchanger (channel) (CRD Pump Bearing Cooler)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-4	3.3.1-48	E
42	Heat Exchanger (channel) (CRD Pump Bearing Cooler)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.C2-8	3.3.1-85	C
43	Heat Exchanger (channel) (CRD Pump Bearing Cooler)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
44	Heat Exchanger (shell) (CRD Pump Bearing Cooler)	Structural integrity	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.C2-5	3.3.1-26	C 0308
45	Heat Exchanger (shell) (CRD Pump Bearing Cooler)	Structural integrity	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.C2-5	3.3.1-26	C
46	Heat Exchanger (shell) (CRD Pump Bearing Cooler)	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
47	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
48	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
49	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
50	Piping	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
51	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
52	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
53	Piping	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VII.E4-15	3.3.1-38	A
54	Piping	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E4-15	3.3.1-38	E

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
55	Piping	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0305
56	Piping	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0305
57	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
58	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
59	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
60	Piping	Pressure boundary	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A 0305
61	Piping	Pressure boundary	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A 0305
62	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
63	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
64	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
65	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
66	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
67	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
68	Piping	Structural integrity	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.C2-13	3.3.1-14	A
69	Piping	Structural integrity	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.C2-13	3.3.1-14	A
70	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
71	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
72	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
73	Pump Casing (CRD-P-1A, 1B)	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
74	Pump Casing (CRD-P-1A, 1B)	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
75	Pump Casing (CRD-P-1A, 1B)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
76	Pump Casing (CRD-P-2A, 2B)	Structural integrity	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.C2-13	3.3.1-14	A 0308
77	Pump Casing (CRD-P-2A, 2B)	Structural integrity	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.C2-13	3.3.1-14	A
78	Pump Casing (CRD-P-2A, 2B)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
79	Rupture Disc	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
80	Rupture Disc	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
81	Strainer (body)	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
82	Strainer (body)	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
83	Strainer (body)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
84	Tank (CRD-TK-126/*)	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	C
85	Tank (CRD-TK-126/*)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
86	Tank (CRD-TK-SDIV1A, 1B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
87	Tank (CRD-TK-SDIV1A, 1B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
88	Tubing	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
89	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System									
90	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
91	Tubing	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VII.E4-15	3.3.1-38	A
92	Tubing	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E4-15	3.3.1-38	E
93	Tubing	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0305
94	Tubing	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0305
95	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
96	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
97	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
98	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
99	Valve Body	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
100	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
101	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
102	Valve Body	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VII.E4-15	3.3.1-38	A
103	Valve Body	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E4-15	3.3.1-38	E
104	Valve Body	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0305
105	Valve Body	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0305

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
106	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
107	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
108	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
109	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
110	Valve Body	Pressure boundary	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A 0305
111	Valve Body	Pressure boundary	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A 0305
112	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
113	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
114	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A

Table 3.3.2-11 Aging Management Review Results – Control Rod Drive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
115	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
116	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
117	Valve Body	Structural integrity	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.C2-13	3.3.1-14	A
118	Valve Body	Structural integrity	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.C2-13	3.3.1-14	A
119	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
120	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
121	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-12 Aging Management Review Results – Control Room Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Pressure boundary	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
4	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
5	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
6	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
7	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
8	Filter Body	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
9	Filter Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.F1-19	3.3.1-14	A

Table 3.3.2-12 Aging Management Review Results – Control Room Chilled Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Filter Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.F1-19	3.3.1-14	A
11	Filter Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
12	Flexible Connection	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
13	Flexible Connection	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
14	Heat Exchanger (channel) (CCH-CU-1A, 1B)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B
15	Heat Exchanger (channel) (CCH-CU-1A, 1B)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
16	Heat Exchanger (channel) (CCH-EV-1A, 1B)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B

Table 3.3.2-12 Aging Management Review Results – Control Room Chilled Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
17	Heat Exchanger (channel) (CCH-EV-1A, 1B)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
18	Heat Exchanger (shell) (CCH-CR-1A, 1B)	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	C
19	Heat Exchanger (shell) (CCH-CR-1A, 1B)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
20	Heat Exchanger (tubes) (CCH-CR-1A, 1B)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-6	3.3.1-83	B
21	Heat Exchanger (tubes) (CCH-CR-1A, 1B)	Heat transfer	Copper Alloy	Gas (External)	None	None	VII.J-4	3.3.1-97	C
22	Heat Exchanger (tubes) (CCH-CR-1A, 1B)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-3	3.3.1-82	B
23	Heat Exchanger (tubes) (CCH-CR-1A, 1B)	Pressure boundary	Copper Alloy	Gas (External)	None	None	VII.J-4	3.3.1-97	C

Table 3.3.2-12 Aging Management Review Results – Control Room Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
24	Heat Exchanger (tubes) (chiller lube oil cooler)	Heat transfer	Steel	Lubricating oil (Internal)	Reduction in heat transfer	Lubricating Oil Analysis	N/A	N/A	H
25	Heat Exchanger (tubes) (chiller lube oil cooler)	Heat transfer	Steel	Lubricating oil (Internal)	Reduction in heat transfer	Lubricating Oil Inspection	N/A	N/A	H
26	Heat Exchanger (tubes) (chiller lube oil cooler)	Heat transfer	Steel	Gas (External)	None	None	VII.J-23	3.3.1-97	C
27	Heat Exchanger (tubes) (chiller lube oil cooler)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-5	3.3.1-21	A
28	Heat Exchanger (tubes) (chiller lube oil cooler)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-5	3.3.1-21	A
29	Heat Exchanger (tubes) (chiller lube oil cooler)	Pressure boundary	Steel	Gas (External)	None	None	VII.J-23	3.3.1-97	C
30	Heat Exchanger (tubesheet) (CCH-CR-1A, 1B)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B

Table 3.3.2-12	Aging Management Review Results – Control Room Chilled Water System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
31	Heat Exchanger (tubesheet) (CCH-CR-1A, 1B)	Pressure boundary	Steel	Gas (External)	None	None	VII.J-23	3.3.1-97	C
32	Piping	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
33	Piping	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
34	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
35	Piping	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
36	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.F1-19	3.3.1-14	A
37	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.F1-19	3.3.1-14	A
38	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
39	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-12 Aging Management Review Results – Control Room Chilled Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
40	Piping	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
41	Piping	Structural integrity	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0324
42	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
43	Piping	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
44	Pump Casing (CCH-P-1A, 1B)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
45	Pump Casing (CCH-P-1A, 1B)	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
46	Pump Casing (Chiller aux lube oil pump)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.F1-19	3.3.1-14	A
47	Pump Casing (Chiller aux lube oil pump)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.F1-19	3.3.1-14	A
48	Pump Casing (Chiller aux lube oil pump)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-12 Aging Management Review Results – Control Room Chilled Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
49	Pump Casing (Chiller Compressor)	Pressure boundary	Gray Cast Iron	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
50	Pump Casing (Chiller Compressor)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
51	Pump Casing (Chiller high speed lube oil pump)	Pressure boundary	Aluminum	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	N/A	N/A	G
52	Pump Casing (Chiller high speed lube oil pump)	Pressure boundary	Aluminum	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	N/A	N/A	G
53	Pump Casing (Chiller high speed lube oil pump)	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
54	Pump Casing (Chiller jet lube oil pump)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.F1-19	3.3.1-14	A
55	Pump Casing (Chiller jet lube oil pump)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.F1-19	3.3.1-14	A
56	Pump Casing (Chiller jet lube oil pump)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-12 Aging Management Review Results – Control Room Chilled Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
57	Pump Casing (Chiller low speed lube oil pump)	Pressure boundary	Aluminum	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	N/A	N/A	G
58	Pump Casing (Chiller low speed lube oil pump)	Pressure boundary	Aluminum	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	N/A	N/A	G
59	Pump Casing (Chiller low speed lube oil pump)	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
60	Purge Unit	Gas removal	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
61	Purge Unit	Gas removal	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.F1-19	3.3.1-14	A
62	Purge Unit	Gas removal	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.F1-19	3.3.1-14	A
63	Purge Unit	Gas removal	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
64	Purge Unit	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
65	Purge Unit	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.F1-19	3.3.1-14	A

Table 3.3.2-12 Aging Management Review Results – Control Room Chilled Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
66	Purge Unit	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.F1-19	3.3.1-14	A
67	Purge Unit	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
68	Rupture Disc	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
69	Rupture Disc	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
70	Rupture Disc	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
71	Rupture Disc	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
72	Sight Glass	Pressure boundary	Glass	Gas (Internal)	None	None	N/A	N/A	G
73	Sight Glass	Pressure boundary	Glass	Lubricating oil (Internal)	None	None	VII.J-10	3.3.1-93	A
74	Sight Glass	Pressure boundary	Glass	Air-indoor uncontrolled (External)	None	None	VII.J-8	3.3.1-93	A

Table 3.3.2-12 Aging Management Review Results – Control Room Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
75	Sight Glass	Pressure boundary	Glass	Condensation (External)	None	None	N/A	N/A	G
76	Tubing	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
77	Tubing	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.C1-14	3.3.1-33	A
78	Tubing	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.C1-14	3.3.1-33	A
79	Tubing	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
80	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
81	Tubing	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
82	Valve Body	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
83	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.F1-19	3.3.1-14	A

Table 3.3.2-12 Aging Management Review Results – Control Room Chilled Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
84	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.F1-19	3.3.1-14	A
85	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
86	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
87	Valve Body	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-13 Aging Management Review Results – Demineralized Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
6	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
7	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
8	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
9	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A

Table 3.3.2-13	Aging Management Review Results – Demineralized Water System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
11	Sight Glass	Structural integrity	Glass	Air-indoor uncontrolled (Internal)	None	None	VII.J-8	3.3.1-93	A 0306
12	Sight Glass	Structural integrity	Glass	Treated water (Internal)	None	None	VII.J-13	3.3.1-93	A
13	Sight Glass	Structural integrity	Glass	Air-indoor uncontrolled (External)	None	None	VII.J-8	3.3.1-93	A
14	Sight Glass	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
15	Sight Glass	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
16	Sight Glass	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
17	Sight Glass	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
18	Spectacle Flange	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A

Table 3.3.2-13 Aging Management Review Results – Demineralized Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Spectacle Flange	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
20	Spectacle Flange	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
21	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
22	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
23	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
24	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
25	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
26	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
27	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-13 Aging Management Review Results – Demineralized Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
28	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
29	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
30	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-14 Aging Management Review Results – Diesel Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Air-Handling Unit Housing (DMA-AH-11, 12, 21, 22, 31, 32 & 51)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
2	Air-Handling Unit Housing (DMA-AH-11, 12, 21, 22, 31, 32 & 51)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
3	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
5	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
6	Bolting	Pressure boundary	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
7	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
8	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H

Table 3.3.2-14 Aging Management Review Results – Diesel Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
9	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F4-1	3.3.1-56	C 0302
10	Damper Housing	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.F4-1	3.3.1-56	C 0309
11	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F4-1	3.3.1-56	A
12	Drain Pan	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.F1-1	3.3.1-27	E
13	Drain Pan	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
14	Duct	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C 0306
15	Duct	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
16	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F4-1	3.3.1-56	C 0302
17	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F4-1	3.3.1-56	A

Table 3.3.2-14 Aging Management Review Results – Diesel Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
18	Fan Housing (DEA-FN-11, 12, 21, 22, 31, 32 & 52)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
19	Fan Housing (DEA-FN-11, 12, 21, 22, 31, 32 & 52)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
20	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F4-6	3.3.1-11	E
21	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F4-6	3.3.1-11	E
22	Heat Exchanger (header) (DMA-CC-11, 12, 21, 22, 31 & 32)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B
23	Heat Exchanger (header) (DMA-CC-11, 12, 21, 22, 31 & 32)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
24	Heat Exchanger (fins) (DMA-CC-11, 12, 21, 22, 31 & 32)	Heat transfer	Aluminum	Condensation (External)	Cracking	Open-Cycle Cooling Water	N/A	N/A	H

Table 3.3.2-14 Aging Management Review Results – Diesel Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
25	Heat Exchanger (fins) (DMA-CC-11, 12, 21, 22, 31 & 32)	Heat transfer	Aluminum	Condensation (External)	Loss of material	Open-Cycle Cooling Water	VII.F2-12	3.3.1-27	E
26	Heat Exchanger (fins) (DMA-CC-11, 12, 21, 22, 31 & 32)	Heat transfer	Aluminum	Condensation (External)	Reduction in heat transfer	Open-Cycle Cooling Water	N/A	N/A	H
27	Heat Exchanger (tubes) (DMA-CC-11, 12, 21, 22, 31 & 32)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-6	3.3.1-83	B
28	Heat Exchanger (tubes) (DMA-CC-11, 12, 21, 22, 31 & 32)	Heat transfer	Copper Alloy	Condensation (External)	Reduction in heat transfer	Open-Cycle Cooling Water	N/A	N/A	H
29	Heat Exchanger (tubes) (DMA-CC-11, 12, 21, 22, 31 & 32)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-3	3.3.1-82	B
30	Heat Exchanger (tubes) (DMA-CC-11, 12, 21, 22, 31 & 32)	Pressure boundary	Copper Alloy	Condensation (External)	Loss of material	Open-Cycle Cooling Water	VII.F2-14	3.3.1-25	E

Table 3.3.2-14 Aging Management Review Results – Diesel Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
31	Mechanical Sealants	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
32	Mechanical Sealants	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
33	Piping	Structural integrity	Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.G-23	3.3.1-71	E
34	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
35	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
36	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
37	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
38	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G

Table 3.3.2-15 Aging Management Review Results – Diesel Cooling Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Flexible Connection	Pressure boundary	Elastomer	Closed cycle cooling water (Internal)	Hardening and loss of strength	Flexible Connection Inspection	VII.A4-1	3.3.1-12	E 0312
4	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	Flexible Connection Inspection	VII.F4-6	3.3.1-11	E
5	Flexible Connection	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
6	Flexible Connection	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
7	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
8	Flexible Connection	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.H2-23	3.3.1-47	B
9	Flexible Connection	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H2-23	3.3.1-47	E

Table 3.3.2-15 Aging Management Review Results – Diesel Cooling Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Flexible Connection	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
11	Heat Exchanger (channel) (DCW-HX-1A1,1A2,1B1, 1B2,1C)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F4-8	3.3.1-48	B
12	Heat Exchanger (channel) (DCW-HX-1A1,1A2,1B1, 1B2,1C)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F4-8	3.3.1-48	E
13	Heat Exchanger (channel) (DCW-HX-1A1,1A2,1B1, 1B2,1C)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.H2-3	3.3.1-59	A
14	Heat Exchanger (channel) (DCW-HX-2C)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-5	3.3.1-21	A
15	Heat Exchanger (channel) (DCW-HX-2C)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-5	3.3.1-21	A

Table 3.3.2-15 Aging Management Review Results – Diesel Cooling Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
16	Heat Exchanger (channel) (DCW-HX-2C)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.H2-3	3.3.1-59	A
17	Heat Exchanger (shell) (DCW-HX-1A1,1A2,1B1, 1B2,1C)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F4-8	3.3.1-48	B
18	Heat Exchanger (shell) (DCW-HX-1A1,1A2,1B1, 1B2,1C)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F4-8	3.3.1-48	E
19	Heat Exchanger (shell) (DCW-HX-1A1,1A2,1B1, 1B2,1C)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.H2-3	3.3.1-59	A
20	Heat Exchanger (shell) (DCW-HX-2C)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-5	3.3.1-21	A
21	Heat Exchanger (shell) (DCW-HX-2C)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-5	3.3.1-21	A

Table 3.3.2-15 Aging Management Review Results – Diesel Cooling Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
22	Heat Exchanger (shell) (DCW-HX-2C)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.H2-3	3.3.1-59	A
23	Heat Exchanger (tubes) (DCW-HX-1A1, 1A2, 1B1, 1B2)	Heat transfer	Stainless Steel	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.H2-6	3.3.1-83	B
24	Heat Exchanger (tubes) (DCW-HX-1A1, 1A2, 1B1, 1B2)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-3	3.3.1-52	B
25	Heat Exchanger (tubes) (DCW-HX-1A1, 1A2, 1B1, 1B2)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	Heat Exchangers Inspection	VII.C2-3	3.3.1-52	E
26	Heat Exchanger (tubes) (DCW-HX-1A1, 1A2, 1B1, 1B2)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.H2-18	3.3.1-80	D
27	Heat Exchanger (tubes) (DCW-HX-1A1, 1A2, 1B1, 1B2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D

Table 3.3.2-15 Aging Management Review Results – Diesel Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Heat Exchanger (tubes) (DCW-HX-1A1, 1A2, 1B1, 1B2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
29	Heat Exchanger (tubes) (DCW-HX-1C)	Heat transfer	Copper Alloy > 15% Zn	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-6	3.3.1-83	B
30	Heat Exchanger (tubes) (DCW-HX-1C)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (External)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-2	3.3.1-52	B
31	Heat Exchanger (tubes) (DCW-HX-1C)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (External)	Reduction in heat transfer	Heat Exchangers Inspection	VII.C2-2	3.3.1-52	E
32	Heat Exchanger (tubes) (DCW-HX-1C)	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.H2-11	3.3.1-80	D 0313
33	Heat Exchanger (tubes) (DCW-HX-1C)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.F3-8	3.3.1-51	B 0313
34	Heat Exchanger (tubes) (DCW-HX-1C)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F3-8	3.3.1-51	E 0313

Table 3.3.2-15 Aging Management Review Results – Diesel Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
35	Heat Exchanger (tubes) (DCW-HX-2C)	Heat transfer	Copper Alloy	Closed cycle cooling water (Internal)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-2	3.3.1-52	B
36	Heat Exchanger (tubes) (DCW-HX-2C)	Heat transfer	Copper Alloy	Closed cycle cooling water (Internal)	Reduction in heat transfer	Heat Exchangers Inspection	VII.C2-2	3.3.1-52	E
37	Heat Exchanger (tubes) (DCW-HX-2C)	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	N/A	N/A	H
38	Heat Exchanger (tubes) (DCW-HX-2C)	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Inspection	N/A	N/A	H
39	Heat Exchanger (tubes) (DCW-HX-2C)	Pressure boundary	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F3-8	3.3.1-51	B
40	Heat Exchanger (tubes) (DCW-HX-2C)	Pressure boundary	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F3-8	3.3.1-51	E
41	Heat Exchanger (tubes) (DCW-HX-2C)	Pressure boundary	Copper Alloy	Lubricating oil (External)	None	None	VII.H2-10	3.3.1-26	I 0311

Table 3.3.2-15 Aging Management Review Results – Diesel Cooling Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
42	Heat Exchanger (tubesheet) (DCW-HX-1A1, 1A2,1B1,1B2)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.H2-18	3.3.1-80	D
43	Heat Exchanger (tubesheet) (DCW-HX-1A1, 1A2,1B1,1B2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
44	Heat Exchanger (tubesheet) (DCW-HX-1A1, 1A2,1B1,1B2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
45	Heat Exchanger (tubesheet) (DCW-HX-1C)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B
46	Heat Exchanger (tubesheet) (DCW-HX-1C)	Pressure boundary	Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
47	Heat Exchanger (tubesheet) (DCW-HX-1C)	Pressure boundary	Steel	Closed cycle cooling water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-1	3.3.1-48	E

Table 3.3.2-15 Aging Management Review Results – Diesel Cooling Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
48	Piping	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
49	Piping	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
50	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
51	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
52	Piping	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.H2-23	3.3.1-47	B
53	Piping	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H2-23	3.3.1-47	E
54	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
55	Sight Glass	Pressure boundary	Glass	Air-indoor uncontrolled (Internal)	None	None	VII.J-8	3.3.1-93	A 0306
56	Sight Glass	Pressure boundary	Glass	Closed cycle cooling water (Internal)	None	None	VII.J-13	3.3.1-93	A 0312

Table 3.3.2-15 Aging Management Review Results – Diesel Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
57	Sight Glass	Pressure boundary	Glass	Air-indoor uncontrolled (External)	None	None	VII.J-8	3.3.1-93	A
58	Tank (Expansion Tank)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.H2-23	3.3.1-47	B
59	Tank (Expansion Tank)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H2-23	3.3.1-47	E
60	Tank (Expansion Tank)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.H2-21	3.3.1-71	E 0303
61	Tank (Expansion Tank)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
62	Tank (Reservoir Tank)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.H2-23	3.3.1-47	B
63	Tank (Reservoir Tank)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H2-23	3.3.1-47	E
64	Tank (Reservoir Tank)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.H2-21	3.3.1-71	E 0303
65	Tank (Reservoir Tank)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-15 Aging Management Review Results – Diesel Cooling Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
66	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
67	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
68	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
69	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
70	Valve Body	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
71	Valve Body	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
72	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
73	Valve Body	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.H2-23	3.3.1-47	B
74	Valve Body	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H2-23	3.3.1-47	E

Table 3.3.2-15 Aging Management Review Results – Diesel Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
75	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-16 Aging Management Review Results – Diesel (Engine) Exhaust System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Filter Housing (DE-F-1A1,1B1)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
4	Filter Housing (DE-F-1A1,1B1)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
5	Filter Housing (DE-F-1)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
6	Filter Housing (DE-F-1)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
7	Filter Housing (DE-F-1)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-20	3.3.1-14	A
8	Filter Housing (DE-F-1)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
9	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	None	None	VII.F4-6	3.3.1-11	I 0306

Table 3.3.2-16 Aging Management Review Results – Diesel (Engine) Exhaust System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	None	None	VII.F4-6	3.3.1-11	I
11	Flexible Connection	Pressure boundary	Stainless Steel	Air-outdoor (Internal)	None	None	N/A	N/A	G
12	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
13	Flexible Connection	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
14	Flexible Connection (exhaust)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	Diesel Systems Inspection	VII.H2-2	3.3.1-18	E 0322
15	Flexible Connection	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
16	Heat Exchanger (shell) (Turbocharger Aftercooler)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.H2-3	3.3.1-59	A 0302
17	Heat Exchanger (shell) (Turbocharger Aftercooler)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.H2-3	3.3.1-59	A

Table 3.3.2-16	Aging Management Review Results – Diesel (Engine) Exhaust System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
18	Heat Exchanger (cover) (Turbocharger Aftercooler)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.H2-3	3.3.1-59	A 0302
19	Heat Exchanger (cover) (Turbocharger Aftercooler)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.H2-3	3.3.1-59	A
20	Heat Exchanger (tubes) (Turbocharger Aftercooler)	Heat transfer	Copper Alloy	Closed cycle cooling water (Internal)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-2	3.3.1-52	B
21	Heat Exchanger (tubes) (Turbocharger Aftercooler)	Heat transfer	Copper Alloy	Closed cycle cooling water (Internal)	Reduction in heat transfer	Heat Exchangers Inspection	VII.C2-2	3.3.1-52	E
22	Heat Exchanger (tubes) (Turbocharger Aftercooler)	Heat transfer	Copper Alloy	Air-indoor uncontrolled (External)	Reduction in heat transfer	Heat Exchangers Inspection	N/A	N/A	G
23	Heat Exchanger (tubes) (Turbocharger Aftercooler)	Pressure boundary	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII. F3-8	3.3.1-51	B

Table 3.3.2-16 Aging Management Review Results – Diesel (Engine) Exhaust System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
24	Heat Exchanger (tubes) (Turbocharger Aftercooler)	Pressure boundary	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII. F3-8	3.3.1-51	E
25	Heat Exchanger (tubes) (Turbocharger Aftercooler)	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
26	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
27	Piping (exhaust)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	Diesel Systems Inspection	VII.H2-2	3.3.1-18	E 0322
28	Piping (exhaust)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Diesel Systems Inspection	VII.H2-22	3.3.1-76	E
29	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
30	Pump Casing (Turbo-charger)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
31	Pump Casing (Turbo-charger)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-16 Aging Management Review Results – Diesel (Engine) Exhaust System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
32	Silencer (Exhaust)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	Diesel Systems Inspection	VII.H2-2	3.3.1-18	E 0322
33	Silencer (Exhaust)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
34	Silencer (Intake)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
35	Silencer (Intake)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
36	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
37	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
38	Valve Body (exhaust)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	Diesel Systems Inspection	VII.H2-2	3.3.1-18	E 0322
39	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-17 Aging Management Review Results – Diesel Engine Starting Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Compressor Casing (DSA-C-1C, 2C)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
6	Compressor Casing (DSA-C-1C, 2C)	Structural integrity	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	C 0308
7	Compressor Casing (DSA-C-1C, 2C)	Structural integrity	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-20	3.3.1-14	C
8	Compressor Casing (DSA-C-1C, 2C)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
9	Filter Body	Structural integrity	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G

Table 3.3.2-17 Aging Management Review Results – Diesel Engine Starting Air System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Filter Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
11	Filter Body	Structural integrity	Steel	Air (Internal)	Loss of material	Air Quality Sampling	N/A	N/A	G
12	Filter Body	Structural integrity	Steel	Air (Internal)	Loss of material	Diesel Starting Air Inspection	N/A	N/A	G
13	Filter Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
14	Flexible Connection	Pressure boundary	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
15	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
16	Heat Exchanger (tubes) (DSA-HX-1A1,1B1)	Structural integrity	Aluminum Alloy	Air (Internal)	None	None	N/A	N/A	G
17	Heat Exchanger (tubes) (DSA-HX-1A1,1B1)	Structural integrity	Aluminum Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
18	Heat Exchanger (tubes) (DSA-HX-2)	Structural integrity	Copper Alloy	Air (Internal)	None	None	N/A	N/A	G

Table 3.3.2-17 Aging Management Review Results – Diesel Engine Starting Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Heat Exchanger (tubes) (DSA-HX-2)	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
20	Oil Fog Lubricator	Pressure boundary	Aluminum Alloy	Air (Internal)	None	None	N/A	N/A	G
21	Oil Fog Lubricator	Pressure boundary	Aluminum Alloy	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	N/A	N/A	G
22	Oil Fog Lubricator	Pressure boundary	Aluminum Alloy	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	N/A	N/A	G
23	Oil Fog Lubricator	Pressure boundary	Aluminum Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
24	Oil Fog Lubricator	Pressure boundary	Copper Alloy > 15% Zn	Air (Internal)	None	None	N/A	N/A	G
25	Oil Fog Lubricator	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-10	3.3.1-26	A
26	Oil Fog Lubricator	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-10	3.3.1-26	A
27	Oil Fog Lubricator	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G

Table 3.3.2-17 Aging Management Review Results – Diesel Engine Starting Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Oil Fog Lubricator	Pressure boundary	Glass	Air (Internal)	None	None	VII.J-7	3.3.1-93	A
29	Oil Fog Lubricator	Pressure boundary	Glass	Lubricating oil (Internal)	None	None	VII.J-10	3.3.1-93	A
30	Oil Fog Lubricator	Pressure boundary	Glass	Air-indoor uncontrolled (External)	None	None	VII.J-8	3.3.1-93	A
31	Oil Fog Lubricator	Spray	Aluminum Alloy	Air (Internal)	None	None	N/A	N/A	G
32	Oil Fog Lubricator	Spray	Aluminum Alloy	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	N/A	N/A	G
33	Oil Fog Lubricator	Spray	Aluminum Alloy	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	N/A	N/A	G
34	Piping	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Diesel Starting Air Inspection	VII.H2-18	3.3.1-80	E
35	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
36	Piping	Pressure boundary	Steel	Air (Internal)	Loss of material	Air Quality Sampling	N/A	N/A	G

Table 3.3.2-17 Aging Management Review Results – Diesel Engine Starting Air System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
37	Piping	Pressure boundary	Steel	Air (Internal)	Loss of material	Diesel Starting Air Inspection	N/A	N/A	G
38	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
39	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Diesel Starting Air Inspection	VII.H2-22	3.3.1-76	E
40	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
41	Piping	Structural integrity	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
42	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
43	Piping	Structural integrity	Steel	Air (Internal)	Loss of material	Air Quality Sampling	N/A	N/A	G 0314
44	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
45	Strainer (body)	Pressure boundary	Steel	Air (Internal)	Loss of material	Air Quality Sampling	N/A	N/A	G

Table 3.3.2-17 Aging Management Review Results – Diesel Engine Starting Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
46	Strainer (body)	Pressure boundary	Steel	Air (Internal)	Loss of material	Diesel Starting Air Inspection	N/A	N/A	G
47	Strainer (body)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
48	Strainer (screen)	Filtration	Stainless Steel	Air (External)	None	None	N/A	N/A	G
49	Tank (DSA-AR-1C,2C)	Pressure boundary	Steel	Air (Internal)	Loss of material	Air Quality Sampling	N/A	N/A	G
50	Tank (DSA-AR-1C,2C)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
51	Tank (DSA-AR-1C,2C)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Air Quality Sampling	VII.H2-22	3.3.1-76	E
52	Tank (DSA-DY-1A,1B,2)	Structural integrity	Steel	Air (Internal)	Loss of material	Air Quality Sampling	N/A	N/A	G
53	Tank (DSA-DY-1A,1B,2)	Structural integrity	Steel	Air (Internal)	Loss of material	Diesel Starting Air Inspection	N/A	N/A	G
54	Tank (DSA-DY-1A,1B,2)	Structural integrity	Steel	Raw water (Internal)	Loss of material	Diesel Starting Air Inspection	VII.H2-22	3.3.1-76	E

Table 3.3.2-17 Aging Management Review Results – Diesel Engine Starting Air System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
55	Tank (DSA-DY-1A,1B,2)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
56	Tank (DSA-TK-1A thru 8A, 1B thru 8B)	Pressure boundary	Steel	Air (Internal)	Loss of material	Air Quality Sampling	N/A	N/A	G
57	Tank (DSA-TK-1A thru 8A, 1B thru 8B)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Air Quality Sampling	VII.H2-22	3.3.1-76	E
58	Tank (DSA-TK-1A thru 8A, 1B thru 8B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
59	Tubing	Pressure boundary	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
60	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
61	Tubing	Structural integrity	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
62	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
63	Valve Body	Pressure boundary	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G

Table 3.3.2-17 Aging Management Review Results – Diesel Engine Starting Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
64	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
65	Valve Body	Pressure boundary	Steel	Air (Internal)	Loss of material	Air Quality Sampling	N/A	N/A	G
66	Valve Body	Pressure boundary	Steel	Air (Internal)	Loss of material	Diesel Starting Air Inspection	N/A	N/A	G
67	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
68	Valve Body	Structural integrity	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
69	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
70	Valve Body	Structural integrity	Steel	Air (Internal)	Loss of material	Air Quality Sampling	N/A	N/A	G 0314
71	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
4	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
5	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
6	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
7	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
8	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
9	Filter Body	Pressure boundary	Gray Cast Iron	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B

Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Filter Body	Pressure boundary	Gray Cast Iron	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-10	3.3.1-20	A
11	Filter Body	Pressure boundary	Gray Cast Iron	Fuel oil (Internal)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
12	Filter Body	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
13	Filter Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-10	3.3.1-20	A
14	Filter Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
15	Filter Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
16	Flame Arrestor	Structural integrity	Aluminum Alloy	Air-outdoor (Internal)	None	None	N/A	N/A	G 0324
17	Flame Arrestor	Structural integrity	Aluminum Alloy	Air-outdoor (External)	None	None	N/A	N/A	G
18	Flexible Connection	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-6	3.3.1-32	A

Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Flexible Connection	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
20	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
21	Flexible Connection	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-10	3.3.1-20	A
22	Flexible Connection	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
23	Flexible Connection	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
24	Orifice	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-6	3.3.1-32	A
25	Orifice	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
26	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
27	Orifice	Throttling	Stainless Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-6	3.3.1-32	A

Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
28	Orifice	Throttling	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
29	Piping	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0324
30	Piping	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-10	3.3.1-20	A
31	Piping	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
32	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
33	Piping	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
34	Piping	Pressure boundary	Steel	Concrete (External)	None	None	VII.J-21	3.3.1-96	A
35	Piping	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.H1-9	3.3.1-19	A
36	Piping	Structural integrity	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0324

Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
37	Piping	Structural integrity	Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-10	3.3.1-20	A
38	Piping	Structural integrity	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
39	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
40	Piping	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
41	Piping	Structural integrity	Steel	Concrete (External)	None	None	VII.J-21	3.3.1-96	A
42	Piping	Structural integrity	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.H1-9	3.3.1-19	A
43	Pump Casing (DO-P-1A,1B,2)	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-6	3.3.1-32	A
44	Pump Casing (DO-P-1A,1B,2)	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
45	Pump Casing (DO-P-1A,1B,2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
46	Pump Casing (DO-P-1A,1B,2)	Pressure boundary	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
47	Pump Casing (DO-P-1A,1B,2)	Pressure boundary	Stainless Steel	Fuel oil (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-6	3.3.1-32	A
48	Pump Casing (DO-P-1A,1B,2)	Pressure boundary	Stainless Steel	Fuel oil (External)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
49	Strainer (body)	Pressure boundary	Gray Cast Iron	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-10	3.3.1-20	A
50	Strainer (body)	Pressure boundary	Gray Cast Iron	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
51	Strainer (body)	Pressure boundary	Gray Cast Iron	Fuel oil (Internal)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
52	Strainer (body)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
53	Strainer (body)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-10	3.3.1-20	A
54	Strainer (body)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B

Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
55	Strainer (body)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
56	Strainer (screen)	Filtration	Copper Alloy > 15% Zn	Fuel oil (External)	Cracking	Chemistry Program Effectiveness Inspection	N/A	N/A	H
57	Strainer (screen)	Filtration	Copper Alloy > 15% Zn	Fuel oil (External)	Cracking	Fuel Oil Chemistry	N/A	N/A	H
58	Strainer (screen)	Filtration	Copper Alloy > 15% Zn	Fuel oil (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-3	3.3.1-32	A
59	Strainer (screen)	Filtration	Copper Alloy > 15% Zn	Fuel oil (External)	Loss of material	Fuel Oil Chemistry	VII.H1-3	3.3.1-32	B
60	Strainer (screen)	Filtration	Copper Alloy > 15% Zn	Fuel oil (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
61	Strainer (screen)	Filtration	Stainless Steel	Fuel oil (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-6	3.3.1-32	A
62	Strainer (screen)	Filtration	Stainless Steel	Fuel oil (External)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
63	Tank (DO-TK-1A,1B,2)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0324

Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
64	Tank (DO-TK-1A,1B,2)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-10	3.3.1-20	A
65	Tank (DO-TK-1A,1B,2)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
66	Tank (DO-TK-1A,1B,2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
67	Tank (DO-TK-1A,1B,2)	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.H1-9	3.3.1-19	A
68	Tank (DO-TK-3A,3B,3C)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0324
69	Tank (DO-TK-3A,3B,3C)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-10	3.3.1-20	A
70	Tank (DO-TK-3A,3B,3C)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
71	Tank (DO-TK-3A,3B,3C)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
72	Tubing	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-6	3.3.1-32	A

Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
73	Tubing	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
74	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
75	Valve Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-10	3.3.1-20	A
76	Valve Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
77	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
78	Valve Body	Structural integrity	Steel	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.H1-10	3.3.1-20	A
79	Valve Body	Structural integrity	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
80	Valve Body	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A

Table 3.3.2-19 Aging Management Review Results – Diesel Generator System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
4	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
5	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-20	3.3.1-14	A
6	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
7	Sight Glass	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
8	Sight Glass	Pressure boundary	Copper Alloy	Lubricating oil (Internal)	None	None	VII.H2-10	3.3.1-26	I 0311
9	Sight Glass	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G

Table 3.3.2-19 Aging Management Review Results – Diesel Generator System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Sight Glass	Pressure boundary	Glass	Air-indoor uncontrolled (Internal)	None	None	VII.J-8	3.3.1-93	A 0306
11	Sight Glass	Pressure boundary	Glass	Lubricating oil (Internal)	None	None	VII.J-10	3.3.1-93	A
12	Sight Glass	Pressure boundary	Glass	Air-indoor uncontrolled (External)	None	None	VII.J-8	3.3.1-93	A
13	Tank (DG-TK-1,2)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
14	Tank (DG-TK-1,2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	C
15	Tank (DG-TK-1,2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-20	3.3.1-14	C
16	Tank (DG-TK-1,2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-20	Aging Management Review Results – Diesel Lubricating Oil System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Filter Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
4	Filter Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-20	3.3.1-14	A
5	Filter Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
6	Flexible Connection	Pressure boundary	Elastomer	Lubricating oil (Internal)	None	None	N/A	N/A	G
7	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	None	None	VII.F4-6	3.3.1-11	I
8	Flexible Connection	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
9	Flexible Connection	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-20	3.3.1-14	A

Table 3.3.2-20 Aging Management Review Results – Diesel Lubricating Oil System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Flexible Connection	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
11	Heat Exchanger (channel) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-5	3.3.1-21	A
12	Heat Exchanger (channel) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-5	3.3.1-21	A
13	Heat Exchanger (channel) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.H2-3	3.3.1-59	A
14	Heat Exchanger (shell) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-5	3.3.1-21	A
15	Heat Exchanger (shell) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-5	3.3.1-21	A

Table 3.3.2-20 Aging Management Review Results – Diesel Lubricating Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
16	Heat Exchanger (shell) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.H2-3	3.3.1-59	A
17	Heat Exchanger (tubes) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Heat transfer	Copper Alloy	Closed cycle cooling water (Internal)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-2	3.3.1-52	B
18	Heat Exchanger (tubes) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Heat transfer	Copper Alloy	Closed cycle cooling water (Internal)	Reduction in heat transfer	Heat Exchangers Inspection	VII.C2-2	3.3.1-52	E
19	Heat Exchanger (tubes) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	N/A	N/A	H
20	Heat Exchanger (tubes) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Inspection	N/A	N/A	H
21	Heat Exchanger (tubes) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Pressure boundary	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F3-8	3.3.1-51	B

Table 3.3.2-20 Aging Management Review Results – Diesel Lubricating Oil System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
22	Heat Exchanger (tubes) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Pressure boundary	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F3-8	3.3.1-51	E
23	Heat Exchanger (tubes) (DLO-HX-2A1, 2A2, 2B1, 2B2)	Pressure boundary	Copper Alloy	Lubricating oil (External)	None	None	VII.H2-10	3.3.1-26	I 0311
24	Orifice	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-10	3.3.1-26	A 0308
25	Orifice	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-10	3.3.1-26	A
26	Orifice	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
27	Orifice	Throttling	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-10	3.3.1-26	A 0308
28	Orifice	Throttling	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-10	3.3.1-26	A
29	Piping	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A

Table 3.3.2-20 Aging Management Review Results – Diesel Lubricating Oil System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
30	Piping	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-17	3.3.1-33	A
31	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
32	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
33	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
34	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-20	3.3.1-14	A
35	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
36	Piping	Pressure boundary	Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
37	Piping	Pressure boundary	Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Inspection	VII.H2-20	3.3.1-14	A
38	Pump Casing	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A 0308

Table 3.3.2-20 Aging Management Review Results – Diesel Lubricating Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
39	Pump Casing	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-20	3.3.1-14	A
40	Pump Casing	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
41	Sight Glass	Pressure boundary	Glass	Lubricating oil (Internal)	None	None	VII.J-10	3.3.1-93	A
42	Sight Glass	Pressure boundary	Glass	Air-indoor uncontrolled (External)	None	None	VII.J-8	3.3.1-93	A
43	Sight Glass	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
44	Sight Glass	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-17	3.3.1-33	A
45	Sight Glass	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
46	Strainer (body)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-10	3.3.1-26	A 0308
47	Strainer (body)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-10	3.3.1-26	A

Table 3.3.2-20 Aging Management Review Results – Diesel Lubricating Oil System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
48	Strainer (body)	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
49	Strainer (body)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
50	Strainer (body)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-20	3.3.1-14	A
51	Strainer (body)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
52	Strainer (screen)	Filtration	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
53	Strainer (screen)	Filtration	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Inspection	VII.H2-17	3.3.1-33	A
54	Tubing	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
55	Tubing	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-17	3.3.1-33	A
56	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-20 Aging Management Review Results – Diesel Lubricating Oil System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
57	Valve Body	Pressure boundary	Copper Alloy	Lubricating oil (Internal)	None	None	VII.H2-10	3.3.1-26	I 0311
58	Valve Body	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
59	Valve Body	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
60	Valve Body	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-17	3.3.1-33	A
61	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
62	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
63	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-20	3.3.1-14	A
64	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-21 Aging Management Review Results – Equipment Drains Radioactive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Heat Exchanger (channel) (EDR-HX-2)	Structural integrity	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-5	3.3.1-77	E
6	Heat Exchanger (channel) (EDR-HX-2)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
7	Heat Exchanger (shell) (EDR-HX-2)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
8	Heat Exchanger (shell) (EDR-HX-2)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-1	3.3.1-48	E

Table 3.3.2-21 Aging Management Review Results – Equipment Drains Radioactive System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
9	Heat Exchanger (shell) (EDR-HX-2)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
10	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
11	Orifice	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
12	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
13	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
14	Piping	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
15	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
16	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302

Table 3.3.2-21 Aging Management Review Results – Equipment Drains Radioactive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
17	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-19	3.3.1-76	E
18	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
19	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	VII.I-8	3.3.1-58	E 0303
20	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A 0315
21	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A 0315
22	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
23	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
24	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-15	3.3.1-24	E

Table 3.3.2-21 Aging Management Review Results – Equipment Drains Radioactive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
25	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
26	Piping	Structural integrity	Stainless Steel	Concrete (External)	None	None	VII.J-17	3.3.1-96	A
27	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
28	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-19	3.3.1-76	E
29	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-18	3.3.1-17	E
30	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
31	Piping	Structural integrity	Steel	Concrete (External)	None	None	VII.J-21	3.3.1-96	A
32	Sight Glass	Structural integrity	Glass	Air-indoor uncontrolled (Internal)	None	None	VII.J-8	3.3.1-93	A 0306
33	Sight Glass	Structural integrity	Glass	Treated water (Internal)	None	None	VII.J-13	3.3.1-93	A

Table 3.3.2-21 Aging Management Review Results – Equipment Drains Radioactive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
34	Sight Glass	Structural integrity	Glass	Air-indoor uncontrolled (External)	None	None	VII.J-8	3.3.1-93	A
35	Sight Glass	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
36	Sight Glass	Structural integrity	Steel	Treated water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-18	3.3.1-17	E
37	Sight Glass	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
38	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
39	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
40	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
41	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
42	Valve Body	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E

Table 3.3.2-21 Aging Management Review Results – Equipment Drains Radioactive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
43	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
44	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
45	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-19	3.3.1-76	E
46	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
47	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
48	Valve Body	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
49	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
50	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
51	Valve Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-19	3.3.1-76	E

Table 3.3.2-21 Aging Management Review Results – Equipment Drains Radioactive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
52	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-18	3.3.1-17	E
53	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
4	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
5	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
6	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
7	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
8	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H

Table 3.3.2-22 Aging Management Review Results –Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
9	Exhaust Silencer	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.H2-2	3.3.1-18	E 0322
10	Exhaust Silencer	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
11	Flame Arrestor	Pressure boundary	Aluminum Alloy	Air-outdoor (Internal)	None	None	N/A	N/A	G
12	Flame Arrestor	Pressure boundary	Aluminum Alloy	Air-outdoor (External)	None	None	N/A	N/A	G
13	Flexible Connection	Pressure boundary	Elastomer	Fuel oil (Internal)	None	None	N/A	N/A	G
14	Flexible Connection	Pressure boundary	Elastomer	Lubricating oil (Internal)	None	None	N/A	N/A	G
15	Flexible Connection	Pressure boundary	Elastomer	Raw water (Internal)	None	None	VII.C1-1	3.3.1-75	I
16	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	Flexible Connection Inspection	VII.F1-7	3.3.1-11	E

Table 3.3.2-22 Aging Management Review Results –Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
17	Flexible Connection (exhaust)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.H2-2	3.3.1-18	E 0322
18	Flexible Connection	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
19	Heat Exchanger (FP-ENG-1 Coolant) (shell)	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Diesel-Driven Fire Pumps Inspection	N/A	N/A	H 0316 0318
20	Heat Exchanger (FP-ENG-1 Coolant) (shell)	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.C1-3	3.3.1-82	E 0316
21	Heat Exchanger (FP-ENG-1 Coolant) (shell)	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-4	3.3.1-84	A 0316
22	Heat Exchanger (FP-ENG-1 Coolant) (shell)	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
23	Heat Exchanger (FP-ENG-1 Coolant) (shell)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.G-24	3.3.1-68	E 0316

Table 3.3.2-22	Aging Management Review Results –Fire Protection System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
24	Heat Exchanger (FP-ENG-1 Coolant) (shell)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	C 0316
25	Heat Exchanger (FP-ENG-1 Coolant) (shell)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
26	Heat Exchanger (FP-ENG-1 Coolant) (tubes)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Diesel-Driven Fire Pumps Inspection	VII.C1-6	3.3.1-83	E
27	Heat Exchanger (FP-ENG-1 Coolant) (tubes)	Heat transfer	Copper Alloy	Raw water (External)	Reduction in heat transfer	Diesel-Driven Fire Pumps Inspection	VII.C1-6	3.3.1-83	E 0316
28	Heat Exchanger (FP-ENG-1 Coolant) (tubes)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.C1-3	3.3.1-82	E
29	Heat Exchanger (FP-ENG-1 Coolant) (tubes)	Pressure boundary	Copper Alloy	Raw water (External)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.C1-3	3.3.1-82	E 0316

Table 3.3.2-22 Aging Management Review Results –Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
30	Heat Exchanger (FP-ENG-1 Lube Oil) (shell)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.G-11	3.3.1-26	C 0308
31	Heat Exchanger (FP-ENG-1 Lube Oil) (shell)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.G-11	3.3.1-26	C
32	Heat Exchanger (FP-ENG-1 Lube Oil) (shell)	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
33	Heat Exchanger (FP-ENG-1 Lube Oil) (shell)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-5	3.3.1-21	A
34	Heat Exchanger (FP-ENG-1 Lube Oil) (shell)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-5	3.3.1-21	A
35	Heat Exchanger (FP-ENG-1 Lube Oil) (shell)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
36	Heat Exchanger (FP-ENG-1 Lube Oil) (tubes)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Diesel-Driven Fire Pumps Inspection	VII.C1-6	3.3.1-83	E 0316

Table 3.3.2-22	Aging Management Review Results –Fire Protection System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
37	Heat Exchanger (FP-ENG-1 Lube Oil) (tubes)	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	N/A	N/A	H
38	Heat Exchanger (FP-ENG-1 Lube Oil) (tubes)	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Inspection	N/A	N/A	H
39	Heat Exchanger (FP-ENG-1 Lube Oil) (tubes)	Heat transfer	Copper Alloy	Lubricating oil (External)	None	None	N/A	N/A	G
40	Heat Exchanger (FP-ENG-1 Lube Oil) (tubes)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.C1-3	3.3.1-82	E 0316
41	Heat Exchanger (FP-ENG-110 Coolant) (shell)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.G-24	3.3.1-68	E 0316
42	Heat Exchanger (FP-ENG-110 Coolant) (shell)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	C 0316
43	Heat Exchanger (FP-ENG-110 Coolant) (shell)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-22 Aging Management Review Results –Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
44	Heat Exchanger (FP-ENG-110 Coolant) (tubes)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Diesel-Driven Fire Pumps Inspection	VII.C1-6	3.3.1-83	E
45	Heat Exchanger (FP-ENG-110 Coolant) (tubes)	Heat transfer	Copper Alloy	Raw water (External)	Reduction in heat transfer	Diesel-Driven Fire Pumps Inspection	VII.C1-6	3.3.1-83	E 0316
46	Heat Exchanger (FP-ENG-110 Coolant) (tubes)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.G-12	3.3.1-70	E
47	Heat Exchanger (FP-ENG-110 Coolant) (tubes)	Pressure boundary	Copper Alloy	Raw water (External)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.C1-3	3.3.1-82	E 0316
48	Heat Exchanger (FP-ENG-110 Lube Oil) (shell)	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.G-18	3.3.1-33	C
49	Heat Exchanger (FP-ENG-110 Lube Oil) (shell)	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.G-18	3.3.1-33	C

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
50	Heat Exchanger (FP-ENG-110 Lube Oil) (shell)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
51	Heat Exchanger (FP-ENG-110 Lube Oil) (tubes)	Heat transfer	Stainless Steel	Raw water (Internal)	Reduction in heat transfer	Diesel-Driven Fire Pumps Inspection	VII.G-7	3.3.1-83	E 0316
52	Heat Exchanger (FP-ENG-110 Lube Oil) (tubes)	Heat transfer	Stainless Steel	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	N/A	N/A	H
53	Heat Exchanger (FP-ENG-110 Lube Oil) (tubes)	Heat transfer	Stainless Steel	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Inspection	N/A	N/A	H
54	Heat Exchanger (FP-ENG-110 Lube Oil) (tubes)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.H2-18	3.3.1-80	E 0316
55	Heat Exchanger (FP-ENG-110 Lube Oil) (tubes)	Pressure boundary	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VII.G-18	3.3.1-33	C
56	Heat Exchanger (FP-ENG-110 Lube Oil) (tubes)	Pressure boundary	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Inspection	VII.G-18	3.3.1-33	C

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
57	Hydrant	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
58	Hydrant	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
59	Hydrant	Pressure boundary	Gray Cast Iron	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
60	Hydrant	Pressure boundary	Gray Cast Iron	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.G-25	3.3.1-19	A
61	Hydrant	Pressure boundary	Gray Cast Iron	Soil (External)	Loss of material	Selective Leaching Inspection	VII.G-15	3.3.1-85	A
62	Orifice	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-19	3.3.1-69	A
63	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
64	Orifice	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
65	Orifice	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
66	Orifice	Throttling	Stainless Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-19	3.3.1-69	A
67	Orifice	Throttling	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
68	Piping	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
69	Piping	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
70	Piping	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
71	Piping	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
72	Piping	Pressure boundary	Gray Cast Iron	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A

Table 3.3.2-22	Aging Management Review Results –Fire Protection System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
73	Piping	Pressure boundary	Gray Cast Iron	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.G-25	3.3.1-19	A
74	Piping	Pressure boundary	Gray Cast Iron	Soil (External)	Loss of material	Selective Leaching Inspection	VII.G-15	3.3.1-85	A
75	Piping	Pressure boundary	Polymer	Raw water (Internal)	None	None	N/A	N/A	F
76	Piping	Pressure boundary	Polymer	Soil (External)	None	None	N/A	N/A	F
77	Piping	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-19	3.3.1-69	A
78	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
79	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
80	Piping	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0324

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
81	Piping	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
82	Piping (exhaust)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.H2-2	3.3.1-18	E 0322
83	Piping	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fire Protection	VII.G-21	3.3.1-64	B
84	Piping	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.G-21	3.3.1-64	B
85	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.G-22	3.3.1-14	A
86	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.G-22	3.3.1-14	A
87	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
88	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-22	Aging Management Review Results –Fire Protection System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
89	Piping	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.G-25	3.3.1-19	A
90	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
91	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
92	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
93	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
94	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
95	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
96	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
97	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Gray Cast Iron	Raw water (External)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
98	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Gray Cast Iron	Raw water (External)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
99	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.G-23	3.3.1-71	E 0303
100	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
101	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
102	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	VII.I-8	3.3.1-58	E
103	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Steel	Raw water (External)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
104	Pump Casing (FP-P-110)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A

Table 3.3.2-22 Aging Management Review Results –Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
105	Pump Casing (FP-P-110)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
106	Pump Casing (FP-P-110)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
107	Pump Casing (Fuel Oil)	Pressure boundary	Gray Cast Iron	Fuel oil (Internal)	Loss of material	Fire Protection	VII.G-21	3.3.1-64	B
108	Pump Casing (Fuel Oil)	Pressure boundary	Gray Cast Iron	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.G-21	3.3.1-64	B
109	Pump Casing (Fuel Oil)	Pressure boundary	Gray Cast Iron	Fuel oil (Internal)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
110	Pump Casing (Fuel Oil)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
111	Pump Casing (Lube Oil)	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.G-22	3.3.1-14	A 0308
112	Pump Casing (Lube Oil)	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.G-22	3.3.1-14	A

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
113	Pump Casing (Lube Oil)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
114	Sight Glass	Pressure boundary	Glass	Air-indoor uncontrolled (Internal)	None	None	VII.J-8	3.3.1-93	A 0306
115	Sight Glass	Pressure boundary	Glass	Raw water (Internal)	None	None	VII.J-11	3.3.1-93	A
116	Sight Glass	Pressure boundary	Glass	Air-indoor uncontrolled (External)	None	None	VII.J-8	3.3.1-93	A
117	Sight Glass	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
118	Sight Glass	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
119	Sight Glass	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
120	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G

Table 3.3.2-22 Aging Management Review Results –Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
121	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Fire Water	N/A	N/A	H 0318
122	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A 0317
123	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
124	Spray Nozzle	Spray	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
125	Spray Nozzle	Spray	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Fire Water	N/A	N/A	H 0318
126	Spray Nozzle	Spray	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A 0317
127	Spray Nozzle	Spray	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
128	Strainer (body)	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
129	Strainer (body)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A
130	Strainer (body)	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
131	Strainer (body)	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
132	Strainer (body)	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Fire Water	N/A	N/A	H 0318
133	Strainer (body)	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A
134	Strainer (body)	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-13	3.3.1-84	A
135	Strainer (body)	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
136	Strainer (body)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302

Table 3.3.2-22 Aging Management Review Results –Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
137	Strainer (body)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
138	Strainer (body)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
139	Strainer (body)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
140	Strainer (body)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
141	Strainer (body)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
142	Strainer (body)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
143	Strainer (screen)	Filtration	Stainless Steel	Raw water (External)	Loss of material	Fire Water	VII.G-19	3.3.1-69	A
144	Tank (DO-TK-3,7)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0309

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
145	Tank (DO-TK-3,7)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fire Protection	VII.G-21	3.3.1-64	D
146	Tank (DO-TK-3,7)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.G-21	3.3.1-64	D
147	Tank (DO-TK-3,7)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
148	Tubing	Pressure boundary	Copper Alloy	Fuel oil (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.G-10	3.3.1-32	A
149	Tubing	Pressure boundary	Copper Alloy	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.G-10	3.3.1-32	B
150	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
151	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
152	Tubing	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-19	3.3.1-69	A

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
153	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
154	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
155	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-19	3.3.1-69	A
156	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
157	Valve Body	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A
158	Valve Body	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
159	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
160	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Fire Water	N/A	N/A	H 0318

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
161	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A
162	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-13	3.3.1-84	A
163	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
164	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Fire Water	N/A	N/A	H 0318
165	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A
166	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-13	3.3.1-84	A
167	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
168	Valve Body	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
169	Valve Body	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
170	Valve Body	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
171	Valve Body	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-19	3.3.1-69	A
172	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
173	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
174	Valve Body (exhaust)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	Diesel-Driven Fire Pumps Inspection	VII.H2-2	3.3.1-18	E 0322
175	Valve Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fire Protection	VII.G-21	3.3.1-64	B
176	Valve Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.G-21	3.3.1-64	B

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
177	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
178	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
179	Valve Body	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
180	Valve Body	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.G-25	3.3.1-19	A

Table 3.3.2-23 Aging Management Review Results – Floor Drain System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
6	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-19	3.3.1-76	E
7	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
8	Piping	Pressure boundary	Steel	Concrete (External)	None	None	VII.J-21	3.3.1-96	A
9	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302

Table 3.3.2-23 Aging Management Review Results – Floor Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Piping	Structural integrity	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.G-23	3.3.1-71	E
11	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-19	3.3.1-76	E
12	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
13	Piping	Structural integrity	Steel	Concrete (External)	None	None	VII.J-21	3.3.1-96	A
14	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
15	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-19	3.3.1-76	E
16	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-24 Aging Management Review Results – Floor Drain Radioactive System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
6	Orifice	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
7	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
8	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
9	Piping	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E

Table 3.3.2-24			Aging Management Review Results – Floor Drain Radioactive System						
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
11	Piping	Pressure boundary	Stainless Steel	Concrete (External)	None	None	VII.J-17	3.3.1-96	A
12	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
13	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-19	3.3.1-76	E
14	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
15	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	VII.I-8	3.3.1-58	E 0303
16	Piping	Pressure boundary	Steel	Concrete (External)	None	None	VII.J-21	3.3.1-96	A
17	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A 0315
18	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A 0315

Table 3.3.2-24 Aging Management Review Results – Floor Drain Radioactive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
20	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
21	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
22	Piping	Structural integrity	Stainless Steel	Concrete (External)	None	None	VII.J-17	3.3.1-96	A
23	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
24	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-19	3.3.1-76	E
25	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
26	Piping	Structural integrity	Steel	Concrete (External)	None	None	VII.J-21	3.3.1-96	A
27	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306

Table 3.3.2-24 Aging Management Review Results – Floor Drain Radioactive System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
28	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
29	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
30	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
31	Valve Body	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
32	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
33	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
34	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-19	3.3.1-76	E
35	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
36	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306

Table 3.3.2-24 Aging Management Review Results – Floor Drain Radioactive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
37	Valve Body	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
38	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
39	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
40	Valve Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-19	3.3.1-76	E
41	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	C
2	Bolting	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	C
3	Bolting	Pressure boundary	Stainless Steel	Treated water (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
5	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
6	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
7	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
8	Heat exchanger (channel) (FPC-HX-1A, 1B)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-2	3.3.1-23	A

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
9	Heat exchanger (channel) (FPC-HX-1A, 1B)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-2	3.3.1-23	A
10	Heat exchanger (channel) (FPC-HX-1A, 1B)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
11	Heat exchanger (shell) (FPC-HX-1A, 1B)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.A4-3	3.3.1-48	B 0319
12	Heat exchanger (shell) (FPC-HX-1A, 1B)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-3	3.3.1-48	E 0319
13	Heat exchanger (shell) (FPC-HX-1A, 1B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
14	Heat exchanger (tubes) (FPC-HX-1A, 1B)	Heat transfer	Stainless Steel	Treated water (Internal)	Reduction in heat transfer	BWR Water Chemistry	VII.A4-4	3.3.1-03	A
15	Heat exchanger (tubes) (FPC-HX-1A, 1B)	Heat transfer	Stainless Steel	Treated water (Internal)	Reduction in heat transfer	Heat Exchangers Inspection	VII.A4-4	3.3.1-03	A
16	Heat exchanger (tubes) (FPC-HX-1A, 1B)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-2	3.3.1-23	A

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
17	Heat exchanger (tubes) (FPC-HX-1A, 1B)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-2	3.3.1-23	A
18	Heat exchanger (tubes) (FPC-HX-1A,1B)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-3	3.3.1-52	B
19	Heat exchanger (tubes) (FPC-HX-1A,1B)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	Heat Exchangers Inspection	VII.C2-3	3.3.1-52	E
20	Heat exchanger (tubes) (FPC-HX-1A,1B)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
21	Heat exchanger (tubes) (FPC-HX-1A,1B)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
22	Heat exchanger (tubesheet) (FPC-HX-1A, 1B)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-2	3.3.1-23	A
23	Heat exchanger (tubesheet) (FPC-HX-1A, 1B)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-2	3.3.1-23	A

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
24	Heat exchanger (tubesheet) (FPC-HX-1A, 1B)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
25	Heat exchanger (tubesheet) (FPC-HX-1A, 1B)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
26	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
27	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A
28	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
29	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
30	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
31	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
32	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
33	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A
34	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
35	Piping	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
36	Piping	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A
37	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
38	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
39	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
40	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
41	Piping	Pressure boundary	Steel	Concrete (External)	None	None	VII.J-21	3.3.1-96	A
42	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
43	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
44	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
45	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
46	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
47	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.G-24	3.3.1-68	E
48	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
49	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
50	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
51	Piping (FPC spent fuel pool return lines)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	H 0320
52	Piping (FPC suppression pool cleanup return line)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.G-23	3.3.1-71	E 0320
53	Pump Casing (FPC-P-1A, 1B)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
54	Pump Casing (FPC-P-1A, 1B)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A
55	Pump Casing (FPC-P-1A, 1B)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
56	Pump Casing (FPC-P-3)	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
57	Pump Casing (FPC-P-3)	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
58	Pump Casing (FPC-P-3)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
59	Screen (Skimmer Tank)	Filtration	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	C
60	Screen (Skimmer Tank)	Filtration	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	C

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
61	Strainer	Filtration	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
62	Strainer	Filtration	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A
63	Strainer	Filtration	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
64	Strainer	Filtration	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A
65	Strainer	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
66	Strainer	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A
67	Strainer	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
68	Strainer	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A
69	Tank (FPC-TK-1A, 1B)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.G-23	3.3.1-71	E 0303
70	Tank (FPC-TK-1A, 1B)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	C
71	Tank (FPC-TK-1A, 1B)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	C
72	Tank (FPC-TK-1A, 1B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
73	Tank (FPC-TK-1A, 1B)	Pressure boundary	Steel	Concrete (External)	None	None	VII.J-21	3.3.1-96	C
74	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
75	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
76	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
77	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
78	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
79	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A
80	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
81	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
82	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
83	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
84	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
85	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
86	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
87	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.A4-11	3.3.1-24	A
88	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.A4-11	3.3.1-24	A
89	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-25 Aging Management Review Results – Fuel Pool Cooling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
90	Valve Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.G-24	3.3.1-68	E
91	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
92	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
93	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-26 Aging Management Review Results – Miscellaneous Waste Radioactive System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
6	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
7	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
8	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
9	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-26 Aging Management Review Results – Miscellaneous Waste Radioactive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Piping	Structural integrity	Stainless Steel	Concrete (External)	None	None	VII.J-17	3.3.1-96	A
11	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
12	Valve Body	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
13	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
14	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
15	Valve Body	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
16	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-27 Aging Management Review Results – Plant Sanitary Drains System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
2	Bolting	Structural integrity	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
3	Bolting	Structural integrity	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
4	Piping	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.G-23	3.3.1-71	E
5	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.G-24	3.3.1-68	E
6	Piping	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
7	Piping	Structural integrity	Steel	Moist air (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.G-23	3.3.1-71	E
8	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.G-24	3.3.1-68	E

Table 3.3.2-27 Aging Management Review Results – Plant Sanitary Drains System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
9	Piping	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-28 Aging Management Review Results – Plant Service Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Annubar	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
2	Annubar	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
3	Annubar	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
5	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
6	Bolting	Structural integrity	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
7	Bolting	Structural integrity	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
8	Bolting	Structural integrity	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
9	Flow Indicator	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B

Table 3.3.2-28 Aging Management Review Results – Plant Service Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Flow Indicator	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
11	Flow Indicator	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
12	Orifice	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
13	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
14	Orifice	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
15	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
16	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
17	Piping	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
18	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302

Table 3.3.2-28	Aging Management Review Results – Plant Service Water System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
19	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
20	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
21	Piping	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
22	Strainer (body)	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
23	Strainer (body)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
24	Strainer (body)	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
25	Strainer (body)	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
26	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
27	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-28 Aging Management Review Results – Plant Service Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
28	Tubing	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
29	Valve Body	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
30	Valve Body	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
31	Valve Body	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	A
32	Valve Body	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
33	Valve Body	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
34	Valve Body	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
35	Valve Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
36	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-28 Aging Management Review Results – Plant Service Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
37	Valve Body	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-29 Aging Management Review Results – Potable Cold Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Piping	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
2	Piping	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
3	Piping	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
4	Piping	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A
5	Piping	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
6	Piping	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
7	Pump Casing (PWC-P-4A/B)	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
8	Pump Casing (PWC-P-4A/B)	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A
9	Pump Casing (PWC-P-4A/B)	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E

Table 3.3.2-29 Aging Management Review Results – Potable Cold Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Pump Casing (PWC-P-4A/B)	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
11	Shock Suppressor	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
12	Shock Suppressor	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
13	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
14	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
15	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
16	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A
17	Tank (shell and end cap)	Structural integrity	Aluminum	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.G-8	3.3.1-62	E
18	Tank (shell and end cap)	Structural integrity	Aluminum	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-14	3.3.1-27	E

Table 3.3.2-29 Aging Management Review Results – Potable Cold Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Tank (shell and end cap)	Structural integrity	Aluminum	Condensation (External)	Cracking	External Surfaces Monitoring	N/A	N/A	H
20	Tank (bushing)	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.G-24	3.3.1-68	E
21	Tank (bushing)	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	C
22	Tank (bushing)	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
23	Tank (bushing)	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
24	Tubing	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
25	Tubing	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
26	Tubing	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
27	Tubing	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A

Table 3.3.2-29 Aging Management Review Results – Potable Cold Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Tubing	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
29	Tubing	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
30	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
31	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A
32	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
33	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G

Table 3.3.2-30 Aging Management Review Results – Potable Hot Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Piping	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
2	Piping	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
3	Piping	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
4	Piping	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A
5	Piping	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
6	Shock Suppressor	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
7	Shock Suppressor	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
8	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
9	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A

Table 3.3.2-30 Aging Management Review Results – Potable Hot Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A

Table 3.3.2-31 Aging Management Review Results – Primary Containment System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
4	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
5	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
6	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
7	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
8	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-32 Aging Management Review Results – Process Sampling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Structural integrity	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
2	Bolting	Structural integrity	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
3	Bolting	Structural integrity	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
4	Orifice	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
5	Orifice	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
6	Piping	Structural integrity	Polymer	Raw water (Internal)	None	None	N/A	N/A	F
7	Piping	Structural integrity	Polymer	Condensation (External)	None	None	N/A	N/A	F
8	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
9	Piping	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-32 Aging Management Review Results – Process Sampling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Strainer (body)	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
11	Strainer (body)	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
12	Tubing	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-9	3.3.1-81	B
13	Tubing	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
14	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
15	Tubing	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
16	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Open-Cycle Cooling Water	N/A	N/A	H
17	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-9	3.3.1-81	B
18	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A

Table 3.3.2-32 Aging Management Review Results – Process Sampling System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
19	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
20	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G

Table 3.3.2-33 Aging Management Review Results – Process Sampling Radioactive System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Filter Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
6	Filter Body	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
7	Filter Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0315
8	Filter Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0315
9	Filter Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-33 Aging Management Review Results – Process Sampling Radioactive System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Filter Body	Structural integrity	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0315
11	Filter Body	Structural integrity	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0315
12	Heat Exchanger (shell) (PSR-CC-1)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
13	Heat Exchanger (shell) (PSR-CC-1)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
14	Heat Exchanger (shell) (PSR-CC-1)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
15	Heat Exchanger (shell) (S-HX-2C)	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B
16	Heat Exchanger (shell) (S-HX-2C)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
17	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306

Table 3.3.2-33	Aging Management Review Results – Process Sampling Radioactive System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
18	Piping	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
19	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-15	3.3.1-24	E
20	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
21	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
22	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
23	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0315
24	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0315
25	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-15	3.3.1-24	E

Table 3.3.2-33	Aging Management Review Results – Process Sampling Radioactive System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
26	Piping	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Monitoring and Collection Systems Inspection	VII.E3-16	3.3.1-37	E
27	Piping	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-15	3.3.1-24	E 0305
28	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G 0303
29	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
30	Piping	Structural integrity	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0315
31	Piping	Structural integrity	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0315
32	Pump Casing (PSR-P-4 through 9)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
33	Pump Casing (PSR-P-4)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-15	3.3.1-24	E

Table 3.3.2-33 Aging Management Review Results – Process Sampling Radioactive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
34	Pump Casing (PSR-P-5 through 9)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
35	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
36	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
37	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-15	3.3.1-24	E
38	Tubing	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Monitoring and Collection Systems Inspection	VII.E3-16	3.3.1-37	E
39	Tubing	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-15	3.3.1-24	E 0305
40	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-33 Aging Management Review Results – Process Sampling Radioactive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
41	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
42	Valve Body	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
43	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-15	3.3.1-24	E
44	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
45	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
46	Valve Body	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
47	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-15	3.3.1-24	E
48	Valve Body	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Monitoring and Collection Systems Inspection	VII.E3-16	3.3.1-37	E

Table 3.3.2-33 Aging Management Review Results – Process Sampling Radioactive System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
49	Valve Body	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.E3-15	3.3.1-24	E 0305
50	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-34 Aging Management Review Results – Pump House HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Air-Handling Unit Housing (PMA-AH-81A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
2	Air-Handling Unit Housing (PMA-AH-81A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
3	Bird Screen	Filtration	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
6	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
7	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
8	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B

Table 3.3.2-34 Aging Management Review Results – Pump House HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
9	Bolting	Pressure boundary	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
10	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
11	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
12	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
13	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
14	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
15	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
16	Drain Pan	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.F1-1	3.3.1-27	E
17	Drain Pan	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C

Table 3.3.2-34 Aging Management Review Results – Pump House HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
18	Drain Pan	Structural integrity	Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.F2-3	3.3.1-72	E
19	Drain Pan	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
20	Duct	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C 0306
21	Duct	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
22	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
23	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
24	Fan Cooler Unit Housing (PRA-FC-1A/B, 91A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
25	Fan Cooler Unit Housing (PRA-FC-1A/B, 91A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A

Table 3.3.2-34 Aging Management Review Results – Pump House HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
26	Fan Housing (POA-FN-2A)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
27	Fan Housing (POA-FN-2A)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
28	Fan Housing (PEA-FN-81A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
29	Fan Housing (PEA-FN-81A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
30	Filter Housing (PRA-FL-1A/B & 2A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
31	Filter Housing (PRA-FL-1A/B & 2A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
32	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F2-7	3.3.1-11	E
33	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F2-7	3.3.1-11	E

Table 3.3.2-34 Aging Management Review Results – Pump House HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
34	Heat Exchanger (header) (PRA-CC-1A/B, 91A/B)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B
35	Heat Exchanger (header) (PRA-CC-1A/B, 91A/B)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
36	Heat Exchanger (fins) (PRA-CC-1A/B, 91A/B)	Heat transfer	Aluminum	Condensation (External)	Cracking	Open-Cycle Cooling Water	N/A	N/A	H
37	Heat Exchanger (fins) (PRA-CC-1A/B, 91A/B)	Heat transfer	Aluminum	Condensation (External)	Loss of material	Open-Cycle Cooling Water	VII.F2-12	3.3.1-27	E
38	Heat Exchanger (fins) (PRA-CC-1A/B, 91A/B)	Heat transfer	Aluminum	Condensation (External)	Reduction in heat transfer	Open-Cycle Cooling Water	N/A	N/A	H
39	Heat Exchanger (tubes) (PRA-CC-1A/B, 91A/B)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-6	3.3.1-83	B

Table 3.3.2-34 Aging Management Review Results – Pump House HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
40	Heat Exchanger (tubes) (PRA-CC-1A/B, 91A/B)	Heat transfer	Copper Alloy	Condensation (External)	Reduction in heat transfer	Open-Cycle Cooling Water	N/A	N/A	H
41	Heat Exchanger (tubes) (PRA-CC-1A/B, 91A/B)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-3	3.3.1-82	B
42	Heat Exchanger (tubes) (PRA-CC-1A/B, 91A/B)	Pressure boundary	Copper Alloy	Condensation (External)	Loss of material	Open-Cycle Cooling Water	VII.F2-14	3.3.1-25	E
43	Heat Exchanger (header) (PMA-CC-81A/B)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B
44	Heat Exchanger (header) (PMA-CC-81A/B)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
45	Heat Exchanger (fins) (PMA-CC-81A/B)	Heat transfer	Aluminum	Condensation (External)	Cracking	Open-Cycle Cooling Water	N/A	N/A	H

Table 3.3.2-34 Aging Management Review Results – Pump House HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
46	Heat Exchanger (fins) (PMA-CC-81A/B)	Heat transfer	Aluminum	Condensation (External)	Loss of material	Open-Cycle Cooling Water	VII.F2-12	3.3.1-27	E
47	Heat Exchanger (fins) (PMA-CC-81A/B)	Heat transfer	Aluminum	Condensation (External)	Reduction in heat transfer	Open-Cycle Cooling Water	N/A	N/A	H
48	Heat Exchanger (tubes) (PMA-CC-81A/B)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-6	3.3.1-83	B
49	Heat Exchanger (tubes) (PMA-CC-81A/B)	Heat transfer	Copper Alloy	Condensation (External)	Reduction in heat transfer	Open-Cycle Cooling Water	N/A	N/A	H
50	Heat Exchanger (tubes) (PMA-CC-81A/B)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-3	3.3.1-82	B
51	Heat Exchanger (tubes) (PMA-CC-81A/B)	Pressure boundary	Copper Alloy	Condensation (External)	Loss of material	Open-Cycle Cooling Water	VII.F2-14	3.3.1-25	E
52	Mechanical Sealants	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
53	Mechanical Sealants	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E

Table 3.3.2-34 Aging Management Review Results – Pump House HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
54	Piping	Structural integrity	Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.G-23	3.3.1-71	E
55	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
56	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
57	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
58	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
59	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G

Table 3.3.2-35 Aging Management Review Results – Radwaste Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
2	Bolting	Structural integrity	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
3	Bolting	Structural integrity	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
4	Piping	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
5	Piping	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
6	Piping	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
7	Piping	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F2-18	3.3.1-47	B
8	Piping	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F2-18	3.3.1-47	E
9	Piping	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-35 Aging Management Review Results – Radwaste Building Chilled Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Strainer (body)	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F2-13	3.3.1-51	B
11	Strainer (body)	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F2-13	3.3.1-51	E
12	Strainer (body)	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-14	3.3.1-25	E
13	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F2-13	3.3.1-51	B
14	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F2-13	3.3.1-51	E
15	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.F2-15	3.3.1-84	A
16	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-14	3.3.1-25	E
17	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
18	Strainer (body)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F2-18	3.3.1-47	B

Table 3.3.2-35 Aging Management Review Results – Radwaste Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Strainer (body)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F2-18	3.3.1-47	E
20	Strainer (body)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.C2-8	3.3.1-85	A
21	Strainer (body)	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
22	Strainer (body)	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
23	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
24	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
25	Tubing	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
26	Valve Body	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F2-13	3.3.1-51	B
27	Valve Body	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F2-13	3.3.1-51	E

Table 3.3.2-35 Aging Management Review Results – Radwaste Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Valve Body	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-14	3.3.1-25	E
29	Valve Body	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F2-18	3.3.1-47	B
30	Valve Body	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F2-18	3.3.1-47	E
31	Valve Body	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.C2-8	3.3.1-85	A
32	Valve Body	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
33	Valve Body	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Air-Handling Unit Housing (WMA-AH-51A/B, 52A/B, 53A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
2	Air-Handling Unit Housing (WMA-AH-51A/B, 52A/B, 53A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
3	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
5	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
6	Bolting	Pressure boundary	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
7	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
8	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
9	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	F
10	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
11	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
12	Bolting	Structural integrity	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
13	Bolting	Structural integrity	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
14	Bolting	Structural integrity	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	G
15	Condenser (Shell) (WRA-CU-51A/B & 52)	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B
16	Condenser (Shell) (WRA-CU-51A/B & 52)	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
17	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
18	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
19	Drain Pan	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.F1-1	3.3.1-27	E
20	Drain Pan	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
21	Duct	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C 0306
22	Duct	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
23	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
24	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
25	Fan Housing (WEA-FN-51A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
26	Fan Housing (WEA-FN-51A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
27	Fan Housing (WEA-FN-52; WEA-FN-53A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
28	Fan Housing (WEA-FN-52; WEA-FN-53A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
29	Filter Housing (WMA-FU-54A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
30	Filter Housing (WMA-FU-54A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
31	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
32	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
33	Heat Exchanger (header) (WMA-CC-51A1, 51B1, 52A1, 52B1, 53A1, 53A2, 53B1 & 53B2)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B
34	Heat Exchanger (header) (WMA-CC-51A1, 51B1, 52A1, 52B1, 53A1, 53A2, 53B1 & 53B2)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
35	Heat Exchanger (header) (WMA-CC-51A2, 51B2, 52A2 & 52B2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F2-9	3.3.1-48	E
36	Heat Exchanger (header) (WMA-CC-51A2, 51B2, 52A2 & 52B2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F2-9	3.3.1-48	B

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
37	Heat Exchanger (header) (WMA-CC-51A2, 51B2, 52A2 & 52B2)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
38	Heat Exchanger (fins) (WMA-CC-51A2, 51B2, 52A2 & 52B2)	Heat transfer	Aluminum	Condensation (External)	Cracking	Cooling Units Inspection	N/A	N/A	H
39	Heat Exchanger (fins) (WMA-CC-51A2, 51B2, 52A2 & 52B2)	Heat transfer	Aluminum	Condensation (External)	Loss of material	Cooling Units Inspection	VII.F2-12	3.3.1-27	E
40	Heat Exchanger (fins) (WMA-CC-51A2, 51B2, 52A2 & 52B2)	Heat transfer	Aluminum	Condensation (External)	Reduction in heat transfer	Cooling Units Inspection	N/A	N/A	H
41	Heat Exchanger (fins) (WMA-CC-53A2 & 53B2)	Heat transfer	Aluminum	Condensation (External)	Cracking	Open-Cycle Cooling Water	N/A	N/A	H

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
42	Heat Exchanger (fins) (WMA-CC-53A2 & 53B2)	Heat transfer	Aluminum	Condensation (External)	Loss of material	Open-Cycle Cooling Water	VII.F2-12	3.3.1-27	E
43	Heat Exchanger (fins) (WMA-CC-53A2 & 53B2)	Heat transfer	Aluminum	Condensation (External)	Reduction in heat transfer	Open-Cycle Cooling Water	N/A	N/A	H
44	Heat Exchanger (tubes) (WMA-CC-51A1, 51B1, 52A1, 52B1, 53A1, 53A2, 53B1 & 53B2	Heat transfer	Copper Alloy	Condensation (External)	Reduction in heat transfer	Open-Cycle Cooling Water	N/A	N/A	H
45	Heat Exchanger (tubes) (WMA-CC-51A1, 51B1, 52A1, 52B1, 53A1, 53A2, 53B1 & 53B2)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-6	3.3.1-83	B

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
46	Heat Exchanger (tubes) (WMA-CC-51A1, 51B1, 52A1, 52B1, 53A1, 53A2, 53B1 & 53B2)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-3	3.3.1-82	B
47	Heat Exchanger (tubes) (WMA-CC-51A2, 51B2, 52A2 & 52B2)	Heat transfer	Copper Alloy	Closed cycle cooling water (Internal)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.F2-10	3.3.1-52	B
48	Heat Exchanger (tubes) (WMA-CC-51A2, 51B2, 52A2 & 52B2)	Heat transfer	Copper Alloy	Closed cycle cooling water (Internal)	Reduction in heat transfer	Heat Exchangers Inspection	VII.F2-10	3.3.1-52	E
49	Heat Exchanger (tubes) (WMA-CC-51A2, 51B2, 52A2 & 52B2)	Heat transfer	Copper Alloy	Condensation (External)	Reduction in heat transfer	Cooling Units Inspection	N/A	N/A	H

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
50	Heat Exchanger (tubes) (WMA-CC-51A2, 51B2, 52A2 & 52B2)	Pressure boundary	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.F1-8	3.3.1-51	E
51	Heat Exchanger (tubes) (WMA-CC-51A2, 51B2, 52A2 & 52B2)	Pressure boundary	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-8	3.3.1-51	B
52	Heat Exchanger (tubes) (WMA-CC-51A2, 51B2, 52A2 & 52B2)	Pressure boundary	Copper Alloy	Condensation (External)	Loss of material	Cooling Units Inspection	VII.F2-14	3.3.1-25	E
53	Heat Exchanger (tubes) (WMA-CC-53A2 & 53B2)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-3	3.3.1-82	B
54	Heat Exchanger (tubes) (WMA-CC-53A2 & 53B2)	Pressure boundary	Copper Alloy	Condensation (External)	Loss of material	Open-Cycle Cooling Water	VII.F2-14	3.3.1-25	E
55	Mechanical Sealants	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
56	Mechanical Sealants	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
57	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
58	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
59	Piping	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.C1-18	3.3.1-19	A
60	Piping	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.F1-1	3.3.1-27	E
61	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
62	Piping	Pressure boundary	Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.G-23	3.3.1-71	E
63	Piping	Structural integrity	Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.G-23	3.3.1-71	E
64	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
65	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
66	Piping	Structural integrity	Stainless Steel	Condensation (External)	Cracking	External Surfaces Monitoring	N/A	N/A	H
67	Piping	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
68	Sound Absorber Casing	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
69	Sound Absorber Casing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
70	Strainer (body)	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
71	Strainer (body)	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
72	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
73	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G

Table 3.3.2-36	Aging Management Review Results – Radwaste Building HVAC Systems								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
74	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
75	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
76	Tubing	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-9	3.3.1-81	B
77	Tubing	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
78	Tubing	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-14	3.3.1-25	E
79	Tubing	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-9	3.3.1-81	B
80	Tubing	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A
81	Tubing	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
82	Tubing	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-14	3.3.1-25	E

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
83	Tubing	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
84	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
85	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
86	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-9	3.3.1-81	B
87	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A
88	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
89	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-14	3.3.1-25	E
90	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
91	Valve Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
92	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
93	Valve Body	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Air Washer Housing (ROA-AW-1)	Structural integrity	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.H2-21	3.3.1-71	E
2	Air Washer Housing (ROA-AW-1)	Structural integrity	Steel	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-19	3.3.1-76	E
3	Air Washer Housing (ROA-AW-1)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
4	Air-Handling Unit Housing (RRA-AH-7)	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
5	Air-Handling Unit Housing (RRA-AH-7)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
6	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	F
7	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
8	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
9	Bolting	Pressure boundary	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
11	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
12	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	F
13	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
14	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
15	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
16	Damper Housing	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0309
17	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
18	Drain Pan	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.F1-1	3.3.1-27	E

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Drain Pan	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
20	Duct	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C 0306
21	Duct	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
22	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
23	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
24	Fan Cooler Unit Housing (RRA-FC-1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 17, 19 & 20)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
25	Fan Cooler Unit Housing (RRA-FC-1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 17, 19 & 20)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
26	Fan Cooler Unit Housing (RRA-FC-8, 9 & 21)	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
27	Fan Cooler Unit Housing (RRA-FC-8, 9 & 21)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
28	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F3-7	3.3.1-11	E
29	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F3-7	3.3.1-11	E
30	Flexible Connection	Structural integrity	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F3-7	3.3.1-11	E
31	Flexible Connection	Structural integrity	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F3-7	3.3.1-11	E
32	Heat Exchanger (housing) (ROA-HC-1 & 2)	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
33	Heat Exchanger (housing) (ROA-HC-1 & 2)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
34	Heat Exchanger (header) (RRA-CC-1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 17, 19 & 20)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B
35	Heat Exchanger (header) (RRA-CC-1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 17, 19 & 20)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
36	Heat Exchanger (fins) (RRA-CC-1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 17, 19 & 20)	Heat transfer	Aluminum	Condensation (External)	Cracking	Open-Cycle Cooling Water	N/A	N/A	H

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
37	Heat Exchanger (fins) (RRA-CC-1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 17, 19 & 20)	Heat transfer	Aluminum	Condensation (External)	Loss of material	Open-Cycle Cooling Water	VII.F2-12	3.3.1-27	E
38	Heat Exchanger (fins) (RRA-CC-1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 17, 19 & 20)	Heat transfer	Aluminum	Condensation (External)	Reduction in heat transfer	Open-Cycle Cooling Water	N/A	N/A	H
39	Heat Exchanger (header) (ROA-HC-1 & 2)	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	N/A	N/A	G
40	Heat Exchanger (header) (ROA-HC-1 & 2)	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	N/A	N/A	G
41	Heat Exchanger (header) (ROA-HC-1 & 2)	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	G

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
42	Heat Exchanger (header) (ROA-HC-1 & 2)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
43	Heat Exchanger (tubes) (RRA-CC-1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 17, 19 & 20)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-6	3.3.1-83	B
44	Heat Exchanger (tubes) (RRA-CC-1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 17, 19 & 20)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-3	3.3.1-82	B
45	Heat Exchanger (tubes) (RRA-CC-1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 17, 19 & 20)	Pressure boundary	Copper Alloy	Condensation (External)	Loss of material	Open-Cycle Cooling Water	VII.F2-14	3.3.1-25	E

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
46	Heat Exchanger (tubes) (RRA-CC-1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 17, 19 & 20)	Heat transfer	Copper Alloy	Condensation (External)	Reduction in heat transfer	Open-Cycle Cooling Water	N/A	N/A	H
47	Mechanical Sealants	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
48	Mechanical Sealants	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
49	Piping	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
50	Piping	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
51	Piping	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
52	Piping	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A
53	Piping	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-14	3.3.1-25	E

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
54	Piping	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
55	Piping	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.F1-1	3.3.1-27	E
56	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
57	Piping	Structural integrity	Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.G-23	3.3.1-71	E
58	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-19	3.3.1-76	E
59	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	N/A	N/A	G
60	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	N/A	N/A	G
61	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	G

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
62	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
63	Piping	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
64	Pump Casing (ROA-P-1A/B)	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-19	3.3.1-76	E
65	Pump Casing (ROA-P-1A/B)	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	A
66	Pump Casing (ROA-P-1A/B)	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
67	Pump Casing (ROA-P-1A/B)	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
68	Tubing	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
69	Tubing	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
70	Tubing	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E

Table 3.3.2-37	Aging Management Review Results – Reactor Building HVAC Systems								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
71	Tubing	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A
72	Tubing	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
73	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
74	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
75	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-9	3.3.1-81	E
76	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A
77	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-14	3.3.1-25	E
78	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
79	Valve Body	Structural integrity	Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.G-23	3.3.1-71	E

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
80	Valve Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-19	3.3.1-76	E
81	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	N/A	N/A	G
82	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	N/A	N/A	G
83	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	G
84	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
85	Valve Body	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-38 Aging Management Review Results – Reactor Closed Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Annubar	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
2	Annubar	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
3	Annubar	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
4	Annubar	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
5	Annubar	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
6	Annubar	Structural integrity	Stainless Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Cracking	Closed Cooling Water Chemistry	VII.E3-13	3.3.1-46	B

Table 3.3.2-38 Aging Management Review Results – Reactor Closed Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Annubar	Structural integrity	Stainless Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E3-13	3.3.1-46	E
8	Annubar	Structural integrity	Stainless Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B 0307
9	Annubar	Structural integrity	Stainless Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E 0307
10	Annubar	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
11	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
12	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
13	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B

Table 3.3.2-38 Aging Management Review Results – Reactor Closed Cooling Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
14	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
15	Demineralizer (RCC-DM-1)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.C1-15	3.3.1-79	E
16	Demineralizer (RCC-DM-1)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
17	Filter Body	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
18	Filter Body	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-14	3.3.1-47	E
19	Filter Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
20	Heat exchanger (channel) (RCC-HX-1A, 1B, 1C)	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B 0321

Table 3.3.2-38 Aging Management Review Results – Reactor Closed Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
21	Heat exchanger (channel) (RCC-HX-1A,1B, 1C)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
22	Heat exchanger (shell) (RCC-HX-1A, 1B, 1C)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
23	Heat exchanger (shell) (RCC-HX-1A, 1B, 1C)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-1	3.3.1-48	E
24	Heat exchanger (shell) (RCC-HX-1A, 1B, 1C)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
25	Piping	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
26	Piping	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-14	3.3.1-47	E

Table 3.3.2-38 Aging Management Review Results – Reactor Closed Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
27	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
28	Piping	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
29	Piping	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
30	Piping	Structural integrity	Stainless Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Cracking	Closed Cooling Water Chemistry	VII.E3-13	3.3.1-46	B
31	Piping	Structural integrity	Stainless Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E3-13	3.3.1-46	E
32	Piping	Structural integrity	Stainless Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B 0307

Table 3.3.2-38 Aging Management Review Results – Reactor Closed Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
33	Piping	Structural integrity	Stainless Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E 0307
34	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
35	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
36	Piping	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
37	Piping	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-14	3.3.1-47	E
38	Piping	Structural integrity	Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B 0307

Table 3.3.2-38 Aging Management Review Results – Reactor Closed Cooling Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
39	Piping	Structural integrity	Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-14	3.3.1-47	E 0307
40	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.G-24	3.3.1-68	E
41	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
42	Pump Casing (RCC-P-1A, 1B, 1C)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
43	Pump Casing (RCC-P-1A, 1B, 1C)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-14	3.3.1-47	E
44	Pump Casing (RCC-P-1A, 1B, 1C)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
45	Sight Glass	Structural integrity	Glass	Closed cycle cooling water (Internal)	None	None	VII.J-13	3.3.1-93	A 0312

Table 3.3.2-38 Aging Management Review Results – Reactor Closed Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
46	Sight Glass	Structural integrity	Glass	Air-indoor uncontrolled (External)	None	None	VII.J-8	3.3.1-93	A
47	Sight Glass	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
48	Sight Glass	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-14	3.3.1-47	E
49	Sight Glass	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
50	Tank (RCC-TK-1)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
51	Tank (RCC-TK-1)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-14	3.3.1-47	E
52	Tank (RCC-TK-1)	Structural integrity	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.G-23	3.3.1-71	E 0303
53	Tank (RCC-TK-1)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-38 Aging Management Review Results – Reactor Closed Cooling Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
54	Trap Body	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
55	Trap Body	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-14	3.3.1-47	E
56	Trap Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
57	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
58	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
59	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
60	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B

Table 3.3.2-38 Aging Management Review Results – Reactor Closed Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
61	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
62	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Cracking	Closed Cooling Water Chemistry	VII.E3-13	3.3.1-46	B
63	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E3-13	3.3.1-46	E
64	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B 0307
65	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E 0307
66	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-38 Aging Management Review Results – Reactor Closed Cooling Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
67	Valve Body	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
68	Valve Body	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
69	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
70	Valve Body	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
71	Valve Body	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-14	3.3.1-47	E
72	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
73	Valve Body	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B

Table 3.3.2-38 Aging Management Review Results – Reactor Closed Cooling Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
74	Valve Body	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-10	3.3.1-50	E
75	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
76	Valve Body	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
77	Valve Body	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.C2-14	3.3.1-47	E
78	Valve Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Monitoring and Collection Systems Inspection	VII.G-24	3.3.1-68	E
79	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Heat Exchanger (channel) (RWCU-HX-1A, 1B, 1C)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	C 0305
6	Heat Exchanger (channel) (RWCU-HX-1A, 1B, 1C)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	C 0305
7	Heat Exchanger (channel) (RWCU-HX-1A, 1B, 1C)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	H

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Heat Exchanger (channel) (RWCU-HX-1A, 1B, 1C)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
9	Heat Exchanger (channel) (RWCU-HX-2A, 2B)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	C 0305
10	Heat Exchanger (channel) (RWCU-HX-2A, 2B)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	C 0305
11	Heat Exchanger (channel) (RWCU-HX-2A, 2B)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	H
12	Heat Exchanger (channel) (RWCU-HX-2A, 2B)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
13	Heat Exchanger (channel) (RWCU-HX-3A, 3B)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E3-4	3.3.1-48	B

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
14	Heat Exchanger (channel) (RWCU-HX-3A, 3B)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-4	3.3.1-48	E
15	Heat Exchanger (channel) (RWCU-HX-3A, 3B)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
16	Heat Exchanger (diaphragm) (RWCU-HX-1A, 1B, 1C)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	C 0305
17	Heat Exchanger (diaphragm) (RWCU-HX-1A, 1B, 1C)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	C 0305
18	Heat Exchanger (diaphragm) (RWCU-HX-1A, 1B, 1C)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	H
19	Heat Exchanger (diaphragm) (RWCU-HX-1A, 1B, 1C)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
20	Heat Exchanger (shell) (RWCU-HX-1A, 1B, 1C)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	C 0305
21	Heat Exchanger (shell) (RWCU-HX-1A, 1B, 1C)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	C 0305
22	Heat Exchanger (shell) (RWCU-HX-1A, 1B, 1C)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	H
23	Heat Exchanger (shell) (RWCU-HX-1A, 1B, 1C)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
24	Heat Exchanger (shell) (RWCU-HX-2A, 2B)	Structural integrity	Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E3-4	3.3.1-48	B 0307
25	Heat Exchanger (shell) (RWCU-HX-2A, 2B)	Structural integrity	Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-4	3.3.1-48	E 0307
26	Heat Exchanger (shell) (RWCU-HX-2A, 2B)	Structural integrity	Steel	Closed cycle cooling water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	H

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
27	Heat Exchanger (shell) (RWCU-HX-2A, 2B)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
28	Heat Exchanger (shell) (RWCU-HX-3A, 3B)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	C 0305
29	Heat Exchanger (shell) (RWCU-HX-3A, 3B)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	C 0305
30	Heat Exchanger (shell) (RWCU-HX-3A, 3B)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	H
31	Heat Exchanger (shell) (RWCU-HX-3A, 3B)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
32	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
33	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
34	Orifice	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VII.E3-16	3.3.1-37	E

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
35	Orifice	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E3-16	3.3.1-37	E
36	Orifice (RWCU-FE-40)	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Stress Corrosion Cracking	VII.E3-16	3.3.1-37	E
37	Orifice	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0305
38	Orifice	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0305
39	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
40	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
41	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
42	Orifice	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VII.E3-16	3.3.1-37	E

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
43	Orifice	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E3-16	3.3.1-37	E
44	Orifice	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0305
45	Orifice	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0305
46	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
47	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
48	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
49	Orifice	Throttling	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VII.E3-16	3.3.1-37	E
50	Orifice	Throttling	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E3-16	3.3.1-37	E

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
51	Orifice	Throttling	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0305
52	Orifice	Throttling	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0305
53	Orifice	Throttling	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
54	Piping	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VII.E3-16	3.3.1-37	E
55	Piping	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E3-16	3.3.1-37	E
56	Piping	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0305
57	Piping	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0305
58	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
59	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
60	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
61	Piping	Pressure boundary	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A 0305
62	Piping	Pressure boundary	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A 0305
63	Piping	Pressure boundary	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	H
64	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
65	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
66	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
67	Piping	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VII.E3-16	3.3.1-37	E
68	Piping	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E3-16	3.3.1-37	E
69	Piping (Thermal Sleeve)	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Stress Corrosion Cracking	VII.E3-16	3.3.1-37	E
70	Piping	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0305
71	Piping	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0305
72	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
73	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
74	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
75	Pump Casing (RWCU-P-1A, 1B)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A 0305
76	Pump Casing (RWCU-P-1A, 1B)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A 0305
77	Pump Casing (RWCU-P-1A, 1B)	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	H
78	Pump Casing (RWCU-P-1A, 1B)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
79	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
80	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
81	Tubing	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VII.E3-16	3.3.1-37	E
82	Tubing	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E3-16	3.3.1-37	E

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
83	Tubing	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0305
84	Tubing	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0305
85	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
86	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
87	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
88	Tubing	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VII.E3-16	3.3.1-37	E
89	Tubing	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E3-16	3.3.1-37	E
90	Tubing	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0305

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
91	Tubing	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0305
92	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
93	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
94	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
95	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
96	Valve Body	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VII.E3-16	3.3.1-37	E
97	Valve Body	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E3-16	3.3.1-37	E
98	Valve Body	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0305

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
99	Valve Body	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0305
100	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
101	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
102	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
103	Valve Body	Pressure boundary	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A 0305
104	Valve Body	Pressure boundary	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A 0305
105	Valve Body	Pressure boundary	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	H
106	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
107	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
108	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A
109	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A
110	Valve Body	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VII.E3-16	3.3.1-37	E
111	Valve Body	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VII.E3-16	3.3.1-37	E
112	Valve Body	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-15	3.3.1-24	A 0305
113	Valve Body	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-15	3.3.1-24	A 0305
114	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-39 Aging Management Review Results – Reactor Water Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
115	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A
116	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A
117	Valve Body	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VII.E3-18	3.3.1-17	A 0305
118	Valve Body	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E3-18	3.3.1-17	A 0305
119	Valve Body	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	H
120	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-40 Aging Management Review Results – Service Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Piping	Pressure boundary	Steel	Air (Internal)	Loss of material	Service Air System Inspection	N/A	N/A	G
6	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
7	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
8	Piping	Structural integrity	Steel	Air (Internal)	Loss of material	Service Air System Inspection	N/A	N/A	G
9	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302

Table 3.3.2-40 Aging Management Review Results – Service Air System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
11	Valve Body	Pressure boundary	Steel	Air (Internal)	Loss of material	Service Air System Inspection	N/A	N/A	G
12	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
13	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
14	Valve Body	Structural integrity	Steel	Air (Internal)	Loss of material	Service Air System Inspection	N/A	N/A	G
15	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
16	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-41 Aging Management Review Results – Standby Liquid Control System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Drain Pan	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
6	Drain Pan	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
7	Orifice	Pressure boundary	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	BWR Water Chemistry	VII.E2-1	3.3.1-30	A
8	Orifice	Pressure boundary	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E2-1	3.3.1-30	A

Table 3.3.2-41 Aging Management Review Results – Standby Liquid Control System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
9	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
10	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
11	Piping	Pressure boundary	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	BWR Water Chemistry	VII.E2-1	3.3.1-30	A
12	Piping	Pressure boundary	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E2-1	3.3.1-30	A
13	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
14	Piping	Structural integrity	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
15	Piping	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.D-4	3.3.1-54	E
16	Piping	Structural integrity	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	BWR Water Chemistry	VII.E2-1	3.3.1-30	A

Table 3.3.2-41 Aging Management Review Results – Standby Liquid Control System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
17	Piping	Structural integrity	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E2-1	3.3.1-30	A
18	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E4-14	3.3.1-24	A
19	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E4-14	3.3.1-24	A
20	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
21	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
22	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
23	Pump Casing (SLC-P-1A, 1B)	Pressure boundary	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	BWR Water Chemistry	VII.E2-1	3.3.1-30	A
24	Pump Casing (SLC-P-1A, 1B)	Pressure boundary	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E2-1	3.3.1-30	A

Table 3.3.2-41 Aging Management Review Results – Standby Liquid Control System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
25	Pump Casing (SLC-P-1A, 1B)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
26	Sight Glass	Structural integrity	Polymer	Moist air (Internal)	None	None	N/A	N/A	J
27	Sight Glass	Structural integrity	Polymer	Sodium pentaborate solution (Internal)	None	None	N/A	N/A	J
28	Sight Glass	Structural integrity	Polymer	Air-indoor uncontrolled (External)	None	None	N/A	N/A	J
29	Tank (SLC-TK-1)	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.D-4	3.3.1-54	E 0303
30	Tank (SLC-TK-1)	Pressure boundary	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	BWR Water Chemistry	VII.E2-1	3.3.1-30	C
31	Tank (SLC-TK-1)	Pressure boundary	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E2-1	3.3.1-30	C
32	Tank (SLC-TK-1)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C

Table 3.3.2-41	Aging Management Review Results – Standby Liquid Control System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
33	Tank (SLC-TK-2)	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.D-4	3.3.1-54	E 0303
34	Tank (SLC-TK-2)	Structural integrity	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	BWR Water Chemistry	VII.E2-1	3.3.1-30	C
35	Tank (SLC-TK-2)	Structural integrity	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E2-1	3.3.1-30	C
36	Tank (SLC-TK-2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
37	Tubing	Structural integrity	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	BWR Water Chemistry	VII.E2-1	3.3.1-30	A
38	Tubing	Structural integrity	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E2-1	3.3.1-30	A
39	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
40	Valve Body	Pressure boundary	Cast Austenitic Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	BWR Water Chemistry	VII.E2-1	3.3.1-30	A

Table 3.3.2-41 Aging Management Review Results – Standby Liquid Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
41	Valve Body	Pressure boundary	Cast Austenitic Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E2-1	3.3.1-30	A
42	Valve Body	Pressure boundary	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
43	Valve Body	Pressure boundary	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	BWR Water Chemistry	VII.E2-1	3.3.1-30	A
44	Valve Body	Pressure boundary	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E2-1	3.3.1-30	A
45	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
46	Valve Body	Structural integrity	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
47	Valve Body	Structural integrity	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	BWR Water Chemistry	VII.E2-1	3.3.1-30	A
48	Valve Body	Structural integrity	Stainless Steel	Sodium pentaborate solution (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E2-1	3.3.1-30	A

Table 3.3.2-41 Aging Management Review Results – Standby Liquid Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
49	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VII.E4-14	3.3.1-24	A
50	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VII.E4-14	3.3.1-24	A
51	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
52	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Annubar	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
2	Annubar	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
3	Annubar	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
5	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
6	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
7	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
8	Bolting	Pressure boundary	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
9	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
11	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
12	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
13	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
14	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
15	Bolting	Structural integrity	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
16	Bolting	Structural integrity	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
17	Bolting	Structural integrity	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
18	Expansion Joint	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
19	Expansion Joint	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
20	Expansion Joint	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
21	Flexible Connection	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
22	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
23	Flexible Connection	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
24	Heat Exchanger (tubes and fittings) (SW-P-1A/1B oil cooler)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-6	3.3.1-83	B
25	Heat Exchanger (tubes and fittings) (SW-P-1A/1B oil cooler)	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	N/A	N/A	H

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
26	Heat Exchanger (tubes and fittings) (SW-P-1A/1B oil cooler)	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Inspection	N/A	N/A	H
27	Heat Exchanger (tubes and fittings) (SW-P-1A/1B oil cooler)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-3	3.3.1-82	B
28	Heat Exchanger (tubes and fittings) (SW-P-1A/1B oil cooler)	Pressure boundary	Copper Alloy	Lubricating oil (External)	None	None	VII.C1-8	3.3.1-26	I 0311
29	Nozzle	Pressure boundary	Stainless Steel	Air-outdoor (Internal)	None	None	N/A	N/A	G
30	Nozzle	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
31	Nozzle	Pressure boundary	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
32	Nozzle	Spray	Stainless Steel	Air-outdoor (Internal)	None	None	N/A	N/A	G

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
33	Nozzle	Spray	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
34	Orifice	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
35	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
36	Orifice	Pressure boundary	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
37	Orifice	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
38	Orifice	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
39	Orifice	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
40	Orifice	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
41	Orifice	Structural integrity	Stainless Steel	Air-outdoor (Internal)	None	None	N/A	N/A	G

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
42	Orifice	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
43	Orifice	Structural integrity	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
44	Orifice	Throttling	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
45	Orifice	Throttling	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
46	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
47	Piping	Pressure boundary	Stainless Steel	Air-outdoor (Internal)	None	None	N/A	N/A	G
48	Piping	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
49	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
50	Piping	Pressure boundary	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
51	Piping	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
52	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
53	Piping	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0324
54	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
55	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
56	Piping	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
57	Piping	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
58	Piping	Pressure boundary	Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
59	Piping	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.C1-18	3.3.1-19	A

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
60	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
61	Piping	Structural integrity	Stainless Steel	Air-outdoor (Internal)	None	None	N/A	N/A	G
62	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
63	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
64	Piping	Structural integrity	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
65	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
66	Piping	Structural integrity	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0324
67	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
68	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
69	Piping	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
70	Pump Casing (HPCS-P-2)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.G-23	3.3.1-71	E 0303
71	Pump Casing (HPCS-P-2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	VII.I-8	3.3.1-58	E 0303
72	Pump Casing (HPCS-P-2)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
73	Pump Casing (HPCS-P-2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
74	Pump Casing (HPCS-P-2)	Pressure boundary	Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
75	Pump Casing (SW-P-1A, 1B)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.G-23	3.3.1-71	E 0303
76	Pump Casing (SW-P-1A, 1B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	VII.I-8	3.3.1-58	E 0303
77	Pump Casing (SW-P-1A, 1B)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
78	Pump Casing (SW-P-1A, 1B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
79	Pump Casing (SW-P-1A, 1B)	Pressure boundary	Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
80	Pump Casing (SW-P-2A, 2B)	Structural integrity	Gray Cast Iron	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.G-23	3.3.1-71	E 0303
81	Pump Casing (SW-P-2A, 2B)	Structural integrity	Gray Cast Iron	Moist air (Internal)	Loss of material	Selective Leaching Inspection	N/A	N/A	H
82	Pump Casing (SW-P-2A, 2B)	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
83	Pump Casing (SW-P-2A, 2B)	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	A
84	Pump Casing (SW-P-2A, 2B)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
85	Strainer (body)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
86	Strainer (body)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
87	Strainer (screen)	Filtration	Stainless Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
88	Tubing	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
89	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
90	Tubing	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
91	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
92	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
93	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
94	Tubing	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
95	Valve Body	Pressure boundary	Stainless Steel	Air-outdoor (Internal)	None	None	N/A	N/A	G

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
96	Valve Body	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
97	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
98	Valve Body	Pressure boundary	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
99	Valve Body	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
100	Valve Body	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0324
101	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
102	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
103	Valve Body	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
104	Valve Body	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-42 Aging Management Review Results – Standby Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
105	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
106	Valve Body	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
107	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
108	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
109	Valve Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
110	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-43 Aging Management Review Results – Tower Makeup Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
4	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
5	Bolting	Pressure boundary	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
6	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
7	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
8	Expansion Joint	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
9	Expansion Joint	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E

Table 3.3.2-43 Aging Management Review Results – Tower Makeup Water System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Orifice	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
11	Orifice	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
12	Orifice	Throttling	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
13	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
14	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
15	Piping	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
16	Piping	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
17	Piping	Pressure boundary	Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
18	Piping	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.C1-18	3.3.1-19	A

Table 3.3.2-43	Aging Management Review Results – Tower Makeup Water System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
19	Pump Casing (TMU-P-1A,1B,1C)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
20	Pump Casing (TMU-P-1A,1B,1C)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	A
21	Pump Casing (TMU-P-1A,1B,1C)	Pressure boundary	Gray Cast Iron	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
22	Pump Casing (TMU-P-1A,1B,1C)	Pressure boundary	Gray Cast Iron	Raw water (External)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	A
23	Pump Casing (TMU-P-1A,1B,1C)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
24	Pump Casing (TMU-P-1A,1B,1C)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
25	Pump Casing (TMU-P-1A,1B,1C)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	VII.I-8	3.3.1-58	E 0303
26	Pump Casing (TMU-P-1A,1B,1C)	Pressure boundary	Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
27	Strainer (screen)	Filtration	Stainless Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B

Table 3.3.2-43 Aging Management Review Results – Tower Makeup Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Strainer (screen)	Filtration	Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
29	Strainer (body)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
30	Strainer (body)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
31	Tubing	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
32	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
33	Tubing	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
34	Valve Body	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
35	Valve Body	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	A
36	Valve Body	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-43 Aging Management Review Results – Tower Makeup Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
37	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
38	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
39	Valve Body	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
40	Valve Body	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-44 Aging Management Review Results – Traversing Incore Probe System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Chamber shield (TIP-EQ-5A through 5E)	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
6	Chamber shield (TIP-EQ-5A through 5E)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
7	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
8	Piping	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
9	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-44 Aging Management Review Results – Traversing Incore Probe System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
11	Piping	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
12	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
13	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
14	Valve Body	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
15	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
16	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0306
17	Valve Body	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
18	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

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 takes some 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 takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes:	
0301	Cracking due to settlement was determined not to be an aging effect requiring management for concrete exposed to soil because all Columbia plant concrete components are supported by backfill. The backfill provides safe bearing for the components, and settlements are estimated to be minimal.
0302	The aging effect determination for the Air-indoor uncontrolled (Internal) environment is the same as the NUREG-1801 determination for an Air-indoor uncontrolled (External) environment because the material is the same and the internal environment is equivalent to the external environment evaluated in the NUREG-1801 item Monitoring of the external surface condition will be used to characterize the aging effects on the internal surfaces.
0303	The Supplemental Piping/Tank Inspection will manage loss of material at the air-water interface.

Plant-Specific Notes:	
0304	The normal internal environment of the CIA System is evaluated as pure, dry nitrogen gas; therefore, there are no aging effects requiring management for this component and material. Periodic sampling in accordance with plant procedures assures that this condition is maintained.
0305	For the purpose of NUREG-1801 comparison Treated water > 60 ºC (140 ºF) is equivalent to Treated water for this material and aging effect.
0306	The aging effect determination for the Air-indoor uncontrolled (Internal) environment is the same as the NUREG-1801 determination for an Air-indoor uncontrolled (External) environment because the material is the same and the internal environment is equivalent to the external environment evaluated in the NUREG-1801 item There are no aging effects requiring management.
0307	For the purpose of NUREG-1801 comparison Closed cycle cooling water > 60 ºC (140 ºF) is equivalent to Closed cycle cooling water for this material and aging effect.
0308	In addition to loss of material due to crevice, general, and pitting corrosion, the Lubricating Oil Analysis Program will also manage loss of material due to selective leaching, by assuring that there is no long-term water contamination. The Lubricating Oil Inspection activity will provide confirmation of the effectiveness of the Lubricating Oil Analysis Program in managing loss of material.
0309	For the purposes of this NUREG-1801 comparison, outdoor air as an internal environment is essentially the same as the uncontrolled indoor air environment because the subject internal surfaces are not exposed to weather. Therefore, the aging effect determination for the Air-outdoor (Internal) environment is the same as the NUREG-1801 determination for an Air-indoor uncontrolled (External) environment because the material is the same and the internal environment is equivalent to the external environment evaluated in the NUREG-1801 item. Monitoring of the external surface condition will be used to characterize the aging effects on the internal surfaces.
0310	The Air Quality Sampling Program will ensure that the Control Air System remains dry and free of contaminants, thereby sustaining the aging management review conclusion that there are no aging effects that require management.
0311	The material is not brass or bronze > 15% Zn or aluminum bronze > 8% Aluminum, which is required for the mechanism of crevice or pitting corrosion to be applicable.
0312	For the purposes of NUREG-1801 comparison, Treated Water is equivalent to Closed Cooling Water for this material and aging effect.
0313	DCW-HX-1C tubes are admiralty brass, which is an "inhibited" copper alloy and are not susceptible to selective leaching.
0314	The Diesel Starting Air Inspection is not credited for piping and piping components that are located upstream from the air receiver tanks.

Plant-Specific Notes:	
0315	The BWR Water Chemistry Program and Chemistry Program Effectiveness Inspection will manage loss of material of components submerged in the suppression pool and subject to a treated water environment.
0316	The fire protection diesel engine coolant (antifreeze) is evaluated as Raw Water.
0317	The Fire Water Program also manages loss of material due to selective leaching of fire sprinker system spray nozzles that are normally exposed to a raw water (internal) environment. The copper alloy spray nozzles are inspected or replaced in accordance with the Fire Water Program; the inspection includes detection of selective leaching.
0318	For conservatism, it is assumed that ammonia or ammonium compounds are present in the raw water environment as a by-product of organic decay, as a by-product of MIC, or possibly from fertilizers.
0319	Subject component is exposed to reactor closed cooling (RCC) water.
0320	Subject component has an air-water interface that constitutes an agressive environment.
0321	Subject component is exposed to plant service water (TSW).
0322	Environment is predominantly outdoor air with infrequent, and for short duration, exposure to diesel exhaust.
0323	The internal environment between the outer and inner vessels of CN-TK-1 is conservatively evaluated as air instead of as a vacuum. Since the external surface is exposed to the more aggressive outdoor air environment, aging effects will occur on the external surface before they occur on the internal surface.
0324	The aging effect determination for the Air-outdoor (Internal) environment is the same as the NUREG-1801 determination for an Air-outdoor (External) environment because the material is the same and the internal environment is equivalent to the external environment evaluated in the NUREG-1801 item. Monitoring of the external surface condition will be used to characterize the aging effects on the internal surfaces.

3.4 AGING MANAGEMENT OF STEAM AND POWER CONVERSION SYSTEMS

3.4.1 Introduction

Section 3.4 provides the results of the aging management reviews (AMRs) for those components identified in Section 2.3.4, Steam and Power Conversion Systems, as subject to AMR. The systems or portions of systems are described in the indicated sections of the Application.

- Auxiliary Steam System (Section 2.3.4.1)
- Condensate (Auxiliary) System (Section 2.3.4.2)
- Condensate (Nuclear) System (Section 2.3.4.3)
- Main Steam System (Section 2.3.4.4)
- Main Steam Leakage Control System (Section 2.3.4.5)
- Miscellaneous Drain System (Section 2.3.4.6)
- Reactor Feedwater System (Section 2.3.4.7)

Table 3.4.1, Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component and commodity groups in this section. Text addressing summary items requiring further evaluation is provided in Section 3.4.2.2.

3.4.2 Results

The following tables summarize the results of the AMR for the Steam and Power Conversion Systems.

Table 3.4.2-1	Aging Management Review Results - Auxiliary Steam System
Table 3.4.2-2	Aging Management Review Results - Condensate (Auxiliary) System
Table 3.4.2-3	Aging Management Review Results - Condensate (Nuclear) System
Table 3.4.2-4	Aging Management Review Results - Main Steam System
Table 3.4.2-5	Aging Management Review Results - Main Steam Leakage Control System
Table 3.4.2-6	Aging Management Review Results - Miscellaneous Drain System
Table 3.4.2-7	Aging Management Review Results - Reactor Feedwater System

3.4.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The materials from which specific components and commodities are fabricated, the environments to which they are exposed, the aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above systems in the following sections.

3.4.2.1.1 Auxiliary Steam System

Materials

The materials of construction for subject mechanical components of the Auxiliary Steam System are:

- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Auxiliary Steam System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Steam

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Auxiliary Steam System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Auxiliary Steam System:

- Bolting Integrity Program
- BWR Water Chemistry Program

- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion (FAC) Program
- Selective Leaching Inspection

3.4.2.1.2 Condensate (Auxiliary) System

Materials

The materials of construction for subject mechanical components of the Condensate (Auxiliary) System are:

- Gray cast iron
- Steel

Environments

Subject mechanical components of the Condensate (Auxiliary) System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Treated water > 60 ^{o}C (140 ^{o}F)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Condensate (Auxiliary) System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Condensate (Auxiliary) System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program

3.4.2.1.3 Condensate (Nuclear) System

Materials

The materials of construction for the subject mechanical components of the Condensate (Nuclear) System are:

- Cast austenitic stainless steel (CASS)
- Stainless steel
- Steel

Environments

The subject mechanical components of the Condensate (Nuclear) System are exposed to the following normal operating plant environments:

- Air-indoor uncontrolled
- Air-outdoor
- Condensation
- Moist air
- Soil
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Condensate (Nuclear) System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Condensate (Nuclear) System:

- Aboveground Steel Tanks Inspection
- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- BWR Water Chemistry Program

- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion (FAC) Program
- Supplemental Piping/Tank Inspection

3.4.2.1.4 Main Steam System

Materials

The materials of construction for subject mechanical components of the Main Steam System are:

- Aluminum
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Main Steam System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Dried air
- Moist air
- Steam
- Treated water
- Treated water > 60 ^{o}C (140 ^{o}F)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Main Steam System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Main Steam System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion (FAC) Program
- Selective Leaching Inspection
- Supplemental Piping/Tank Inspection

3.4.2.1.5 Main Steam Leakage Control System

Materials

The materials of construction for subject mechanical components of the Main Steam Leakage Control System are:

- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Main Steam Leakage Control System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Steam

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Main Steam Leakage Control System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Main Steam Leakage Control System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program

3.4.2.1.6 Miscellaneous Drain System

Materials

The materials of construction for subject mechanical components of the Miscellaneous Drain System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Miscellaneous Drain System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Moist air
- Steam

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Miscellaneous Drain System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Miscellaneous Drain System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion (FAC) Program
- Supplemental Piping/Tank Inspection

3.4.2.1.7 Reactor Feedwater System

Materials

The materials of construction for the subject mechanical components of the Reactor Feedwater System are:

- Stainless steel
- Steel

Environments

The subject mechanical components of the Reactor Feedwater System are exposed to the following normal plant operating environments:

- Air-indoor uncontrolled
- Treated water > 60 ^{o}C (140 ^{o}F)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Reactor Feedwater System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Reactor Feedwater System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion (FAC) Program

3.4.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

For the Steam and Power Conversion systems, those items requiring further evaluation are addressed in the following sections.

3.4.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis, as defined in 10 CFR 54.3. Time-limited aging analyses are required to be evaluated in accordance with 10 CFR 54.21(c). Time-limited aging analyses identified for fatigue in the Steam and Power Conversion systems are evaluated in Section 4.3.4.

3.4.2.2.2 Loss of Material due to General, Pitting, and Crevice Corrosion

3.4.2.2.2.1 Piping, Piping Components, Piping Elements, Tanks, and Heat Exchangers

Loss of material due to general, pitting, and crevice corrosion for steel piping components and tanks exposed to treated water (including steam) in the Steam and Power Conversion systems is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components and tanks exposed to treated water.

3.4.2.2.2.2 Piping, Piping Components, and Piping Elements – Lubricating Oil

As described in Table 3.4.1, there are no components compared to item number 3.4.1-07. There are no steel components exposed to a lubricating oil environment that are subject to AMR for the Steam and Power Conversion systems.

3.4.2.2.3 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion (MIC), and Fouling

As described in Table 3.4.1, there are no components compared to item number 3.4.1-08. There are no steel Steam and Power Conversion systems components exposed to raw water and subject to AMR

3.4.2.2.4 Reduction of Heat Transfer due to Fouling

3.4.2.2.4.1 Heat Exchanger Tubes – Treated Water

As described in Table 3.4.1, there are no components compared to item number 3.4.1-09. There are no heat exchanger tubes subject to AMR in the Steam and Power Conversion systems.

3.4.2.2.4.2 Heat Exchanger Tubes – Lubricating Oil

As described in Table 3.4.1, there are no components compared to item number 3.4.1-10. There are no heat exchanger tubes exposed to lubricating oil and subject to AMR in the Steam and Power Conversion systems.

3.4.2.2.5 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

3.4.2.2.5.1 Piping, Piping Components, and Piping Elements - Soil

Loss of material due to general, pitting, and crevice corrosion and MIC for steel piping components with coatings and buried in soil is managed by the Buried Piping and Tanks Inspection Program.

3.4.2.2.5.2 Heat Exchanger Components – Lubricating Oil

As described in Table 3.4.1, there are no components compared to item number 3.4.1-12. There are no steel heat exchanger components exposed to lubricating oil and subject to AMR in the Steam and Power Conversion systems.

3.4.2.2.6 Cracking due to Stress Corrosion Cracking (SCC)

Cracking due to SCC for stainless steel piping components exposed to treated water or steam in the Steam and Power Conversion systems is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage cracking due to SCC through examination of stainless steel piping components exposed to treated water or steam.

In the case of stainless steel bolting submerged in the suppression pool and exposed to treated water, the Bolting Integrity Program is credited with management of cracking.

The Bolting Integrity Program includes the periodic inspection of bolting for indications of degradation.

3.4.2.2.7 Loss of Material due to Pitting and Crevice Corrosion

3.4.2.2.7.1 Piping, Piping Components, Piping Elements, Tanks, and Heat Exchanger Components

There are no aluminum components, no copper alloy components, no stainless steel tanks, and no stainless steel heat exchanger components exposed to treated water and subject to AMR in the Steam and Power Conversion systems.

Loss of material due to pitting and crevice corrosion for stainless steel piping components and loss of material for steel tanks exposed to treated water in the Steam and Power Conversion systems is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material through examination of stainless steel piping components and steel tanks exposed to treated water.

In the case of stainless steel bolting exposed to treated water, the Bolting Integrity Program is credited with management of loss of material. The Bolting Integrity Program includes the periodic inspection of bolting for indications of degradation.

3.4.2.2.7.2 Piping, Piping Components, Piping Elements - Soil

As described in Table 3.4.1, there are no components compared to item number 3.4.1-17. There are no stainless steel piping components in the Steam and Power Conversion systems that are exposed to soil.

3.4.2.2.7.3 Piping, Piping Components, Piping Elements – Lubricating Oil

As described in Table 3.4.1, there are no components compared to item number 3.4.1-18. There are no copper alloy piping components exposed to lubricating oil and subject to AMR in the Steam and Power Conversion systems.

3.4.2.2.8 Loss of Material due to Pitting, Crevice, and Microbiologically Influenced Corrosion

As described in Table 3.4.1, there are no components compared to item number 3.4.1-19. There are no stainless steel piping or heat exchanger components exposed to lubricating oil and subject to AMR in the Steam and Power Conversion systems.

3.4.2.2.9 Loss of Material due to General, Pitting, Crevice, and Galvanic Corrosion

Loss of material due to general, galvanic, pitting, and crevice corrosion for steel heat exchanger components (main condenser shell) exposed to treated water in the Steam and Power Conversion systems is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material through examination of steel heat exchanger components exposed to treated water.

3.4.2.2.10 Quality Assurance for Aging Management of Non-safety Related Components

Quality Assurance provisions applicable to license renewal are discussed in Appendix B, Section B.1.3.

3.4.2.3 Time-Limited Aging Analyses

The time-limited aging analysis identified below are associated with the Steam and Power Conversion Systems components. The section of the application that contains the time-limited aging analysis review results is indicated in parentheses.

- Metal Fatigue (Section 4.3, Metal Fatigue)

3.4.3 Conclusions

The Steam and Power Conversion Systems components and commodities subject to AMR have been identified in accordance with 10 CFR 54.21. The aging management programs selected to manage the effects of aging for the mechanical components and commodities are identified in the following tables and Section 3.4.2.1. A description of the aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging associated with the Steam and Power Conversion Systems components and commodities will be managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-01	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. Refer to Section 3.4.2.2.1 for further information.
3.4.1-02	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. The BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for steel piping, piping components, and piping elements in the steam and power conversion systems exposed to steam. Refer to Section 3.4.2.2.2.1 for further information.
3.4.1-03	PWR Only				

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-04	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 BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for steel piping, piping components, and piping elements in the steam and power conversion systems exposed to treated water, including treated water >60 C (140 ºF). Refer to Section 3.4.2.2.2.1 for further information.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-05	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. The BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for steel heat exchanger components of the main condenser (the waterbox, the hotwell, and the steam space) exposed to treated water. Refer to Section 3.4.2.2.9 for further information.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-06	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. The BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for steel tanks in the steam and power conversion systems exposed to treated water. There are no stainless steel tanks in the steam and power conversion systems exposed to treated water. Refer to Sections 3.4.2.2.2.1 and 3.4.2.2.7.1 for further information.
3.4.1-07	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	Not applicable. There are no steel piping, piping components, or piping elements in the steam and power conversion systems exposed to lubricating oil. Refer to Section 3.4.2.2.2.2 for further information.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-08	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	Not applicable. There are no steel piping, piping components, or piping elements in the steam and power conversion systems exposed to raw water. Refer to Section 3.4.2.2.3 for further information.
3.4.1-09	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	Not applicable. There are no stainless steel or copper alloy heat exchanger tubes in the steam and power conversion systems exposed to treated water. Refer to Section 3.4.2.2.4.1 for further information.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-10	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no steel, stainless steel, or copper alloy heat exchanger tubes in the steam and power conversion systems exposed to lubricating oil. Refer to Section 3.4.2.2.4.2 for further information.
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. The Buried Piping and Tanks Surveillance is not credited for aging management. Consistent with NUREG-1801. The Buried Piping and Tanks Inspection Program is credited to manage loss of material for buried steel piping in the steam and power conversion systems exposed to soil. Refer to Section 3.4.2.2.5.1 for further information.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 in the steam and power conversion systems exposed to lubricating oil. Refer to Section 3.4.2.2.5.2 for further information.
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. The BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage cracking for stainless steel piping, piping components, and piping elements in the steam and power conversion systems exposed to steam. Refer to Section 3.4.2.2.6 for further information.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-14	Stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water >60 °C (>140 °F)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-101. The BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage cracking for stainless steel piping, piping components, and piping elements in the steam and power conversion systems exposed to treated water >60 ºC (140 ºF). This item is also applied to stainless steel bolting associated with the main steam quenchers submerged in, and exposed to the treated water environment of, the suppression pool. The Bolting Integrity Program is credited to manage cracking of this bolting. A Note E is applied. Refer to Section 3.4.2.2.6 for further information.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801					
Item Number	**Component/Commodity**	**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	Not applicable. There are no aluminum or copper alloy piping, piping components, or piping elements in the steam and power conversion systems exposed to treated water. Refer to Section 3.4.2.2.7.1 for further information.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-16	Stainless steel piping, piping components, and piping elements; tanks, and heat exchanger components exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for stainless steel piping, piping components, and piping elements in the steam and power conversion systems exposed to treated water, including treated water >60 C (140 ºF). There are no stainless steel tanks or heat exchanger components in the steam and power conversion systems exposed to treated water. This item is also applied to stainless steel bolting associated with the main steam quenchers submerged in, and exposed to the treated water environment of, the suppression pool. The Bolting Integrity Program is credited to manage loss of material. A Note E is applied. Refer to Section 3.4.2.2.7.1 for further information.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	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	Not applicable. There are no stainless steel piping, piping components, or piping elements in the steam and power conversion systems exposed to soil. Refer to Section 3.4.2.2.7.2 for further information.
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	Not applicable. There are no copper alloy piping, piping components, or piping elements in the steam and power conversion systems exposed to lubricating oil. Refer to Section 3.4.2.2.7.3 for further information.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Not applicable. There are no stainless steel piping, piping components, piping elements, or heat exchanger components in the steam and power conversion system exposed to lubricating oil. Refer to Section 3.4.2.2.8 for further information.
3.4.1-20	Steel tanks exposed to air – outdoor (external)	Loss of material/ general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Consistent with NUREG-1801, with exceptions. The Aboveground Steel Tanks Inspection will detect and characterize loss of material where the base of the steel condensate storage tank (CST) is in contact with the tank foundation and exposed to air-outdoor. The design of the CST foundation allows potential water pooling at the bottom of the tanks due to exposure to precipitation (e.g., rain, snow). Refer also to Item Number 3.4.1-28 below.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-21	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable. There is no high-strength steel bolting in the steam and power conversion systems exposed to air with steam or water leakage.
3.4.1-22	Steel bolting and closure bolting exposed to air with steam or water leakage, air – outdoor (external) or air – indoor uncontrolled (external);	Loss of material due to general, pitting and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. The Bolting Integrity Program is credited to manage loss of material and loss of pre-load for steel bolting in the steam and power conversion systems exposed to air-indoor uncontrolled (external) or air-outdoor (external). Some bolting in the Condensate (Auxiliary) System has an external surface temperature exceeding 212 ºF; therefore, loss of material is not an aging effect requiring management. A Note I is applied

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-23	Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60 °C (>140 °F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	Not applicable. There are no stainless steel piping, piping components, or piping elements in the steam and power conversion systems exposed to closed cycle cooling water >60 C (140 ºF).
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 in the steam and power conversion systems exposed to closed cycle cooling water.
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 piping, piping components, piping elements, or heat exchanger components in the steam and power conversion systems exposed to closed cycle cooling water.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-26	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable. There are no copper alloy piping, piping components, or piping elements in the steam and power conversion systems exposed to closed cycle cooling water.
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 steel, stainless steel, or copper alloy heat exchanger tubes in the steam and power conversion systems exposed to closed cycle cooling water.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	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. Except as noted below, the External Surfaces Monitoring Program is credited to manage loss of material for steel external surfaces in the steam and power conversion systems exposed to air-indoor uncontrolled (external), condensation (external) or air-outdoor (external). This includes the external surfaces of each CST not in contact with the tank foundation (refer to Item Number 3.4.1-20). This item is also applied to steel turbine casings exposed to air-indoor uncontrolled (external); and to steel internal surfaces exposed to air-indoor uncontrolled (internal) where it has been demonstrated that the internal environment is the same as the external environment. The External Surfaces Monitoring Program is credited. A Note C is applied in these cases.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-28 (cont'd)					This item is also applied to air-water interfaces for steel components that penetrate the surface of the suppression pool (subject to alternate wetting and drying). The Supplemental Piping/Tank Inspection is credited to detect and characterize loss of material. A Note E is applied. This item is also applied to steel bolting exposed to condensation (external). The Bolting Integrity Program is credited to manage loss of material. A Note E is applied. This item is also applied to steel piping from each CST that is enclosed in a guard pipe, which is evaluated as exposed to an air-indoor uncontrolled (external) environment. The guard pipe is buried. The Buried Piping and Tanks Inspection Program is credited to manage loss of material. A Note E is applied.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-28 (cont'd)					The temperatures of some steel external surfaces exposed to air-indoor uncontrolled (external) in the Condensate (Auxiliary) System exceed 212 ºF; therefore, loss of material is not an aging effect requiring management. A Note I is applied.
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 (FAC) Program is credited to manage loss of material (wall thinning) due to FAC for steel piping, piping components, and piping elements in the steam and power conversion systems exposed to steam or treated water, including treated water >60 C (140 ºF). This item is also applied to the main condenser shell and the high-pressure turbine casing, which are exposed to treated water and steam, respectively. The Flow-Accelerated Corrosion (FAC) Program is credited. A Note C is applied.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	This item is applied to steel piping in the Condensate (Nuclear) System exposed to air-outdoor (internal). The External Surfaces Monitoring Program is credited to manage loss of material. A Note E is applied.
3.4.1-31	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. There are no steel heat exchanger components in the steam and power conversion systems exposed to raw water.
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	Not applicable. There are no stainless steel or copper alloy piping, piping components, or piping elements in the steam and power conversion systems exposed to raw water.
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 in the steam and power conversion systems exposed to raw water.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	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 steel, stainless steel, or copper alloy heat exchanger tubes in the steam and power conversion systems exposed to raw water.
3.4.1-35	Copper alloy >15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water, raw water or treated water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no copper alloy >15% Zn piping, piping components, or piping elements in the steam and power conversion systems exposed to closed cycle cooling water, raw water, or treated water.
3.4.1-36	Gray cast iron piping, piping components, and piping elements exposed to soil, treated water or raw water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no gray cast iron piping, piping components, or piping elements in the steam and power conversion systems exposed to soil, treated water, or raw water.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	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 BWR Water Chemistry Program is credited to manage loss of material for steel and stainless steel piping, piping components, and piping elements in the steam and power conversion systems exposed to steam. There are no nickel-based alloy piping, piping components, and piping elements in the steam and power conversion systems exposed to steam. Additionally, the Chemistry Program Effectiveness Inspection is credited to verify the effectiveness of the BWR Water Chemistry Program. A Note E is applied. This item is applied to the high-pressure turbine casing (MS-DT-HP) exposed to steam. A Note C is applied.
3.4.1-38	PWR Only				
3.4.1-39	PWR Only				

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-40	Glass piping elements exposed to air, lubricating oil, raw water, and treated water	None	None	NA - No AEM or AMP	Not applicable. There are no glass piping elements in the steam and power conversion systems exposed to air, lubricating oil, raw water, or treated water.
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. No aging effects were identified for stainless steel or copper alloy piping, piping components, or piping elements in the steam and power conversion systems exposed to air-indoor uncontrolled (external). This item is also applied to stainless steel internal surfaces exposed to air-indoor uncontrolled (internal) where it has been demonstrated that the internal environment is the same as the external environment. This item is also applied to stainless steel bolting exposed to air-indoor uncontrolled (external). A Note C is applied.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	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 piping, piping components, or piping elements in the steam and power conversion systems exposed to air-indoor controlled (external). All air-indoor environments were conservatively evaluated as uncontrolled environments.
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 piping, piping components, or piping elements in the steam and power conversion systems embedded in concrete.
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	Consistent with NUREG-1801. This item is applied to aluminum and stainless steel piping components in steam and power conversion systems exposed to dried air. Dried air is not an environment in NUREG-1801 Chapter VIII for aluminum or stainless steel; however, gas is evaluated as an equivalent environment.

Table 3.4.2-1 Aging Management Review Results – Auxiliary Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VIII.H-5	3.4.1-22	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VIII.H-5	3.4.1-22	B
5	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VIII.H-1	3.4.1-22	B
6	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
7	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
8	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.C-4	3.4.1-02	A
9	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-4	3.4.1-02	A

Table 3.4.2-1 Aging Management Review Results – Auxiliary Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.C-5	3.4.1-29	A
11	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
12	Piping	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VIII.H-8	3.4.1-28	A
13	Strainer Body	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.C-4	3.4.1-02	A
14	Strainer Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-4	3.4.1-02	A
15	Strainer Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.C-5	3.4.1-29	A
16	Strainer Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
17	Strainer Body	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VIII.H-8	3.4.1-28	A
18	Trap Body	Structural integrity	Gray Cast Iron	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.C-4	3.4.1-02	A

Table 3.4.2-1 Aging Management Review Results – Auxiliary Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Trap Body	Structural integrity	Gray Cast Iron	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-4	3.4.1-02	A
20	Trap Body	Structural integrity	Gray Cast Iron	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.C-5	3.4.1-29	A
21	Trap Body	Structural integrity	Gray Cast Iron	Steam (Internal)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
22	Trap Body	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
23	Trap Body	Structural integrity	Gray Cast Iron	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VIII.H-8	3.4.1-28	A
24	Trap Body	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VIII.H-8	3.4.1-28	A
25	Trap Body	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.C-4	3.4.1-02	A
26	Trap Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-4	3.4.1-02	A
27	Trap Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.C-5	3.4.1-29	A

Table 3.4.2-1 Aging Management Review Results – Auxiliary Steam System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
28	Trap Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
29	Tubing	Structural integrity	Stainless Steel	Steam (Internal)	Cracking	BWR Water Chemistry	VIII.B2-1	3.4.1-13	A
30	Tubing	Structural integrity	Stainless Steel	Steam (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.B2-1	3.4.1-13	A
31	Tubing	Structural integrity	Stainless Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-2	3.4.1-37	A
32	Tubing	Structural integrity	Stainless Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-2	3.4.1-37	E
33	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
34	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.C-4	3.4.1-02	A
35	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-4	3.4.1-02	A
36	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.C-5	3.4.1-29	A

Table 3.4.2-1 Aging Management Review Results – Auxiliary Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
37	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
38	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.C-4	3.4.1-02	A
39	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-4	3.4.1-02	A
40	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.C-5	3.4.1-29	A
41	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
42	Valve Body	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VIII.H-8	3.4.1-28	A

Table 3.4.2-2		Aging Management Review Results – Condensate (Auxiliary) System							
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	None	None	VIII.H-4	3.4.1-22	I 0406
2	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VIII.H-5	3.4.1-22	B
4	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VIII.H-1	3.4.1-22	B
5	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
6	Condenser (CO-CU-1)	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
7	Condenser (CO-CU-1)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
8	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
9	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-2 Aging Management Review Results – Condensate (Auxiliary) System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Piping	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VIII.E-33	3.4.1-04	A
11	Piping	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-33	3.4.1-04	A
12	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	None	None	VIII.H-7	3.4.1-28	I 0406
13	Piping	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VIII.H-8	3.4.1-28	A
14	Pump Casing (CO-P-4)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
15	Pump Casing (CO-P-4)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
16	Valve Body	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VIII.E-33	3.4.1-04	A
17	Valve Body	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-33	3.4.1-04	A

Table 3.4.2-2 Aging Management Review Results – Condensate (Auxiliary) System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
18	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	None	None	VIII.H-7	3.4.1-28	I 0406
19	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
20	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-3 Aging Management Review Results – Condensate (Nuclear) System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VIII.H-5	3.4.1-22	B
3	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Cracking	Bolting Integrity	N/A	N/A	H 0407
4	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VIII.H-1	3.4.1-22	B
5	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
6	Bolting	Pressure boundary	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
7	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of material	Bolting Integrity	VIII.H-10	3.4.1-28	E
8	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
9	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B

Table 3.4.2-3 Aging Management Review Results – Condensate (Nuclear) System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VIII.H-5	3.4.1-22	B
11	Bolting	Structural integrity	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
12	Bolting	Structural integrity	Steel	Condensation (External)	Loss of material	Bolting Integrity	VIII.H-10	3.4.1-28	E
13	Bolting	Structural integrity	Steel	Condensation (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	H
14	Heat Exchanger (shell), Main Condenser COND-HX-9	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
15	Heat Exchanger (shell), Main Condenser COND-HX-9	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.E-35	3.4.1-29	C
16	Heat Exchanger (shell), Main Condenser COND-HX-9	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-7	3.4.1-05	A

Table 3.4.2-3 Aging Management Review Results – Condensate (Nuclear) System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
17	Heat Exchanger (shell), Main Condenser COND-HX-9	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-7	3.4.1-05	A
18	Heat Exchanger (shell), Main Condenser COND-HX-9	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
19	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-29	3.4.1-16	A
20	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-29	3.4.1-16	A
21	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
22	Orifice	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	N/A	N/A	G
23	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-29	3.4.1-16	A
24	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-29	3.4.1-16	A

Table 3.4.2-3 Aging Management Review Results – Condensate (Nuclear) System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
25	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
26	Orifice	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	N/A	N/A	G
27	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-29	3.4.1-16	A
28	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-29	3.4.1-16	A
29	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
30	Piping	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VIII.B1-6	3.4.1-30	E
31	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-33	3.4.1-04	A
32	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-33	3.4.1-04	A
33	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Buried Piping and Tanks Inspection	VIII.H-7	3.4.1-28	E 0408

Table 3.4.2-3	Aging Management Review Results – Condensate (Nuclear) System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
34	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
35	Piping	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VIII.H-8	3.4.1-28	A
36	Piping	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VIII.H-10	3.4.1-28	A
37	Piping	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VIII.E-1	3.4.1-11	A
38	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VIII.I-10	3.4.1-41	A 0410
39	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-29	3.4.1-16	A
40	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-29	3.4.1-16	A
41	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
42	Piping	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	N/A	N/A	G

Table 3.4.2-3	Aging Management Review Results – Condensate (Nuclear) System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
43	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
44	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-33	3.4.1-04	A
45	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-33	3.4.1-04	A
46	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
47	Piping	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VIII.H-10	3.4.1-28	A
48	Pump Casing (COND-P-3, 4, 5)	Structural integrity	Cast Austenitic Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-29	3.4.1-16	A
49	Pump Casing (COND-P-3, 4, 5)	Structural integrity	Cast Austenitic Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-29	3.4.1-16	A
50	Pump Casing (COND-P-3, 4, 5)	Structural integrity	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A

Table 3.4.2-3 Aging Management Review Results – Condensate (Nuclear) System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
51	Pump Casing (COND-P-3, 4, 5)	Structural integrity	Cast Austenitic Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	N/A	N/A	G
52	Tank (COND-TK-1A, 1B)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-8	3.4.1-28	C 0411
53	Tank (COND-TK-1A, 1B)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
54	Tank (COND-TK-1A, 1B)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-40	3.4.1-06	A
55	Tank (COND-TK-1A, 1B)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-40	3.4.1-06	A
56	Tank (COND-TK-1A, 1B)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Aboveground Steel Tanks Inspection	VIII.E-39	3.4.1-20	B 0409
57	Tank (COND-TK-1A, 1B)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VIII.H-8	3.4.1-28	A
58	Tubing	Pressure boundary	Stainless Steel	Air-outdoor (Internal)	None	None	N/A	N/A	G
59	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-29	3.4.1-16	A

Table 3.4.2-3 Aging Management Review Results – Condensate (Nuclear) System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
60	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-29	3.4.1-16	A
61	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
62	Tubing	Pressure boundary	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
63	Tubing	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F2-1	3.3.1-27	E
64	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-29	3.4.1-16	A
65	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-29	3.4.1-16	A
66	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
67	Tubing	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	N/A	N/A	G
68	Valve Body	Pressure boundary	Stainless Steel	Air-outdoor (Internal)	None	None	N/A	N/A	G

Table 3.4.2-3 Aging Management Review Results – Condensate (Nuclear) System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
69	Valve Body	Pressure boundary	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
70	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
71	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-33	3.4.1-04	A
72	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-33	3.4.1-04	A
73	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
74	Valve Body	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VIII.H-8	3.4.1-28	A
75	Valve Body	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VIII.H-10	3.4.1-28	A
76	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-29	3.4.1-16	A
77	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-29	3.4.1-16	A

Table 3.4.2-3 Aging Management Review Results – Condensate (Nuclear) System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
78	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
79	Valve Body	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	N/A	N/A	G
80	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.E-33	3.4.1-04	A
81	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.E-33	3.4.1-04	A
82	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
83	Valve Body	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VIII.H-10	3.4.1-28	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	C
2	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Treated water (External)	Cracking	Bolting Integrity	VIII.C-2	3.4.1-14	E 0405
4	Bolting	Pressure boundary	Stainless Steel	Treated water (External)	Loss of pre-load	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	Bolting Integrity	VIII.C-1	3.4.1-16	E 0405
6	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
7	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VIII.H-5	3.4.1-22	B
8	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
9	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VIII.H-5	3.4.1-22	B

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Manifold	Pressure boundary	Aluminum	Dried air (Internal)	None	None	VIII.I-1	3.4.1-44	A 0402
11	Manifold	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
12	Moisture Separator	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	C
13	Moisture Separator	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
14	Moisture Separator	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B2-4	3.4.1-29	C
15	Moisture Separator	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
16	Orifice	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
17	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
18	Piping	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	BWR Water Chemistry	VIII.B2-1	3.4.1-13	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Piping	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.B2-1	3.4.1-13	A
20	Piping	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-2	3.4.1-37	A
21	Piping	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-2	3.4.1-37	E
22	Piping	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VIII.C-2	3.4.1-14	A
23	Piping	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.C-2	3.4.1-14	A
24	Piping	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VIII.D2-4	3.4.1-16	A 0403
25	Piping	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.D2-4	3.4.1-16	A 0403
26	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VIII.I-10	3.4.1-41	A 0410

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
27	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
28	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
29	Piping	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
30	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	A
31	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
32	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B2-4	3.4.1-29	A
33	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-6	3.4.1-04	A
34	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-6	3.4.1-04	A
35	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
36	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	VIII.H-7	3.4.1-28	E 0401
37	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VIII.B2-6	3.4.1-04	A
38	Piping	Pressure boundary	Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-6	3.4.1-04	A
39	Piping	Structural integrity	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
40	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	A
41	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
42	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B2-4	3.4.1-29	A
43	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
44	Piping	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
45	Quencher	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.C-1	3.4.1-16	A
46	Quencher	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-1	3.4.1-16	A
47	Quencher	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VIII.C-1	3.4.1-16	A
48	Quencher	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-1	3.4.1-16	A
49	Quencher	Spray	Stainless Steel	Treated water (Internal)	Loss of material	BWR Water Chemistry	VIII.C-1	3.4.1-16	A
50	Quencher	Spray	Stainless Steel	Treated water (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-1	3.4.1-16	A
51	Quencher	Spray	Stainless Steel	Treated water (External)	Loss of material	BWR Water Chemistry	VIII.C-1	3.4.1-16	A
52	Quencher	Spray	Stainless Steel	Treated water (External)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-1	3.4.1-16	A
53	Strainer Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
54	Strainer Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
55	Strainer Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B2-4	3.4.1-29	A
56	Strainer Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
57	Trap Body	Structural integrity	Gray Cast Iron	Moist air (Internal)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
58	Trap Body	Structural integrity	Gray Cast Iron	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
59	Trap Body	Structural integrity	Gray Cast Iron	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	A
60	Trap Body	Structural integrity	Gray Cast Iron	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
61	Trap Body	Structural integrity	Gray Cast Iron	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B2-4	3.4.1-29	A
62	Trap Body	Structural integrity	Gray Cast Iron	Steam (Internal)	Loss of material	Selective Leaching Inspection	N/A	N/A	G

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
63	Trap Body	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
64	Trap Body	Structural integrity	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
65	Trap Body	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	A
66	Trap Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
67	Trap Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B2-4	3.4.1-29	A
68	Trap Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
69	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VIII.I-10	3.4.1-41	A 0410
70	Tubing	Pressure boundary	Stainless Steel	Dried air (Internal)	None	None	VIII.I-12	3.4.1-44	A 0402
71	Tubing	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	BWR Water Chemistry	VIII.B2-1	3.4.1-13	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
72	Tubing	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.B2-1	3.4.1-13	A
73	Tubing	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-2	3.4.1-37	A
74	Tubing	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-2	3.4.1-37	E
75	Tubing	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VIII.C-2	3.4.1-14	A
76	Tubing	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.C-2	3.4.1-14	A
77	Tubing	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VIII.D2-4	3.4.1-16	A 0403
78	Tubing	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.D2-4	3.4.1-16	A 0403
79	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
80	Turbine Casing	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	C
81	Turbine Casing	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
82	Turbine Casing	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B2-4	3.4.1-29	C
83	Turbine Casing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
84	Valve Body	Pressure boundary	Aluminum	Dried air (Internal)	None	None	VIII.I-1	3.4.1-44	A 0402
85	Valve Body	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
86	Valve Body	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	BWR Water Chemistry	VIII.B2-1	3.4.1-13	A
87	Valve Body	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.B2-1	3.4.1-13	A
88	Valve Body	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-2	3.4.1-37	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
89	Valve Body	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-2	3.4.1-37	E
90	Valve Body	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VIII.C-2	3.4.1-14	A
91	Valve Body	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.C-2	3.4.1-14	A
92	Valve Body	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VIII.D2-4	3.4.1-16	A 0403
93	Valve Body	Pressure boundary	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.D2-4	3.4.1-16	A 0403
94	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
95	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
96	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
97	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
98	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B2-4	3.4.1-29	A
99	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
100	Valve Body	Structural integrity	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
101	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-3	3.4.1-37	A
102	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-3	3.4.1-37	E
103	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B2-4	3.4.1-29	A
104	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-5	Aging Management Review Results – Main Steam Leakage Control System								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Annubar	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VIII.I-10	3.4.1-41	A 0410
2	Annubar	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VIII.H-5	3.4.1-22	B
5	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
6	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VIII.H-5	3.4.1-22	B
7	Fan Housing	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
8	Fan Housing	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
9	Filter Housing	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404

Table 3.4.2-5 Aging Management Review Results – Main Steam Leakage Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Filter Housing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
11	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
12	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.C-3	3.4.1-02	A
13	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-3	3.4.1-02	A
14	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
15	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
16	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
17	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VIII.I-10	3.4.1-41	A 0410
18	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A

Table 3.4.2-5 Aging Management Review Results – Main Steam Leakage Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VIII.I-10	3.4.1-41	A 0410
20	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
21	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
22	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.C-3	3.4.1-02	A
23	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-3	3.4.1-02	A
24	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
25	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0404
26	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-6 Aging Management Review Results – Miscellaneous Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VIII.H-5	3.4.1-22	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
4	Bolting	Structural Integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VIII.H-5	3.4.1-22	B
5	Orifice	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	BWR Water Chemistry	VIII.B2-1	3.4.1-13	A
6	Orifice	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.B2-1	3.4.1-13	A
7	Orifice	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-2	3.4.1-37	A
8	Orifice	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-2	3.4.1-37	E
9	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A

Table 3.4.2-6 Aging Management Review Results – Miscellaneous Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Orifice	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
11	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
12	Orifice	Throttling	Stainless Steel	Steam (Internal)	Cracking	BWR Water Chemistry	VIII.B2-1	3.4.1-13	A
13	Orifice	Throttling	Stainless Steel	Steam (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.B2-1	3.4.1-13	A
14	Orifice	Throttling	Stainless Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-2	3.4.1-37	A
15	Orifice	Throttling	Stainless Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-2	3.4.1-37	E
16	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.C-3	3.4.1-02	A
17	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-3	3.4.1-02	A
18	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.C-5	3.4.1-29	A

Table 3.4.2-6 Aging Management Review Results – Miscellaneous Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
20	Piping	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	BWR Water Chemistry	VIII.B2-1	3.4.1-13	A
21	Piping	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.B2-1	3.4.1-13	A
22	Piping	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.B2-2	3.4.1-37	A
23	Piping	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.B2-2	3.4.1-37	E
24	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
25	Piping	Structural integrity	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
26	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
27	Strainer Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.C-3	3.4.1-02	A

Table 3.4.2-6	Aging Management Review Results – Miscellaneous Drain System								
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Strainer Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-3	3.4.1-02	A
29	Strainer Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.C-5	3.4.1-29	A
30	Strainer Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
31	Strainer Body	Structural integrity	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
32	Strainer Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
33	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	VIII.C-3	3.4.1-02	A
34	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.C-3	3.4.1-02	A
35	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.C-5	3.4.1-29	A
36	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-6 Aging Management Review Results – Miscellaneous Drain System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
37	Valve Body	Structural integrity	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	N/A	N/A	G
38	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-7 Aging Management Review Results – Reactor Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
2	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of pre-load	Bolting Integrity	VIII.H-5	3.4.1-22	B
3	Flow Element	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VIII.D2-7	3.4.1-04	A 0403
4	Flow Element	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.D2-7	3.4.1-04	A 0403
5	Flow Element	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.D2-8	3.4.1-29	A 0403
6	Flow Element	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
7	Piping	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	BWR Water Chemistry	VIII.E-31	3.4.1-14	A
8	Piping	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Cracking	Chemistry Program Effectiveness Inspection	VIII.E-31	3.4.1-14	A

Table 3.4.2-7 Aging Management Review Results – Reactor Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
9	Piping	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VIII.D2-4	3.4.1-16	A 0403
10	Piping	Structural integrity	Stainless Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.D2-4	3.4.1-16	A 0403
11	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
12	Piping	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VIII.D2-7	3.4.1-04	A 0403
13	Piping	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.D2-7	3.4.1-04	A 0403
14	Piping	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.D2-8	3.4.1-29	A 0403
15	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
16	Valve Body	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	BWR Water Chemistry	VIII.D2-7	3.4.1-04	A 0403

Table 3.4.2-7 Aging Management Review Results – Reactor Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
17	Valve Body	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	VIII.D2-7	3.4.1-04	A 0403
18	Valve Body	Structural integrity	Steel	Treated water > 60 ºC (140 ºF) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.D2-8	3.4.1-29	A 0403
19	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

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 takes some 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 takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes:	
0401	The Supplemental Piping/Tank Inspection will manage loss of material at the air-water interface on and within the MSRV discharge piping at the surface of the suppression pool.
0402	"Dried air" is not an environment in NUREG-1801 Chapter VIII for aluminum or stainless steel; however, for the purposes of this comparison, "Gas" is an equivalent environment.
0403	"Loss of material" is not an aging effect identified in NUREG-1801 for stainless steel exposed to "Treated water > 60 ºC (140 ºF);" however, loss of material is not dependent on temperature in a treated water environment, so for the purposes of this comparison, "Treated water" is an equivalent environment.

Plant-Specific Notes:	
0404	The aging effect determination for the Air-indoor uncontrolled (Internal) environment is the same as the NUREG-1801 determination for an Air-indoor uncontrolled (External) environment because the material is the same and the internal environment is equivalent to the external environment evaluated in the NUREG-1801 item Monitoring of the external surface condition will be used to characterize the aging effects on the internal surfaces.
0405	Bolting associated with the quenchers is stainless steel and located in the suppression pool.
0406	This steel component has an external surface temperature > 212 ºF. Therefore, the surface is dry and general corrosion is not an aging effect requiring management; there are also no other aging effects requiring management.
0407	The Bolting Integrity Program will also manage cracking for the carbon and low-alloy (steel) bolting at the base and foundation of the CSTs due to potential for ponding or pooling of water.
0408	The Buried Piping and Tanks Inspection Program will manage loss of material for the carbon steel (steel) piping from the CSTs that is enclosed in guard pipe and buried.
0409	The Aboveground Steel Tanks Inspection will detect and characterize loss of material at the base of each CST in contact with the tank foundation.
0410	The aging effect determination for the Air-indoor uncontrolled (Internal) environment is the same as the NUREG-1801 determination for an Air-indoor uncontrolled (External) environment because the material is the same and the internal environment is equivalent to the external environment evaluated in the NUREG-1801 item There are no aging effects requiring management.
0411	The aging effect determination for the Air-outdoor (Internal) environment is the same as the NUREG-1801 determination for an Air-outdoor (External) environment because the material is the same and the internal environment is equivalent to the external environment evaluated in the NUREG-1801 item. Monitoring of the external surface condition will be used to characterize the aging effects on the internal surfaces.

3.5 AGING MANAGEMENT OF CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

3.5.1 Introduction

Section 3.5 provides the results of the aging management reviews (AMRs) for those structural components and commodities identified in Section 2.4, Scoping and Screening Results - Structures, subject to AMR. The structures or structural commodities are described in the indicated sections.

- Primary Containment [Includes Drywell, Suppression Chamber, and internal structural components] (Section 2.4.1)
- Reactor Building [Includes Secondary Containment, Reactor Cavity, Refueling Area, New Fuel Storage Vault, Release Stack] (Section 2.4.2)
- Standby Service Water Pump House 1A and 1B and Spray Pond 1A and 1B (Section 2.4.3)
- Circulating Water Pump House (Section 2.4.4)
- Diesel Generator Building (Section 2.4.5)
- Fresh Air Intake Structure No. 1 and 2 (Section 2.4.6)
- Makeup Water Pump House (Section 2.4.7)
- Radwaste Control Building (Section 2.4.8)
- Service Building (Section 2.4.9)
- Turbine Generator Building (Section 2.4.10)
- Water Filtration Building (Section 2.4.11)
- Yard Structures (Section 2.4.12)
- Bulk Commodities (Section 2.4.13)

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 that are applicable to structural component and commodity groups in this section. Text addressing summary items requiring further evaluation is provided in Section 3.5.2.2.

3.5.2 Results

The following tables summarize the results of the AMR for Containments, Structures, and Component Supports.

Table 3.5.2-1	Aging Management Review Results - Primary Containment
Table 3.5.2-2	Aging Management Review Results - Reactor Building
Table 3.5.2-3	Aging Management Review Results - Standby Service Water Pump House 1A and 1B and Spray Pond 1A and 1B
Table 3.5.2-4	Aging Management Review Results - Circulating Water Pump House
Table 3.5.2-5	Aging Management Review Results - Diesel Generator Building
Table 3.5.2-6	Aging Management Review Results - Fresh Air Intake Structure No. 1 and 2
Table 3.5.2-7	Aging Management Review Results - Makeup Water Pump House
Table 3.5.2-8	Aging Management Review Results - Radwaste Control Building
Table 3.5.2-9	Aging Management Review Results - Service Building
Table 3.5.2-10	Aging Management Review Results - Turbine Generator Building
Table 3.5.2-11	Aging Management Review Results - Water Filtration Building
Table 3.5.2-12	Aging Management Review Results - Yard Structures
Table 3.5.2-13	Aging Management Review Results – Bulk Commodities

3.5.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The materials from which specific components and commodities are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above structures and structural components in the following sections.

3.5.2.1.1 Primary Containment

Materials

Primary Containment structural components subject to AMR are constructed of the following materials:

- Aluminum
- Carbon Steel

- Concrete
- Elastomer
- Galvanized Steel
- Stainless Steel

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Primary Containment structural components subject to AMR are exposed to the following environments:

- Concrete
- Air-indoor
- Treated water
- Raw water

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effect associated with the Primary Containment structural components requires management:

- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Primary Containment structural components:

- Inservice Inspection (ISI) Program – IWE
- Inservice Inspection (ISI) Program – IWF
- Appendix J Program
- Structures Monitoring Program
- BWR Water Chemistry Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.2 Reactor Building

Materials

Reactor Building structural components subject to AMR are constructed of the following materials:

- Aluminum
- Carbon Steel
- Concrete
- Concrete Block or Brick (freestanding or stacked shield wall)
- Galvanized Steel
- Stainless Steel
- Boron Carbide (B4C)

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Reactor Building structural components subject to AMR are exposed to the following environments:

- Soil
- Air-indoor
- Air-outdoor
- Treated water
- Raw water

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effect associated with the Reactor Building structural components requires management:

- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Reactor Building structural components:

- Structures Monitoring Program
- Material Handling System Inspection Program
- BWR Water Chemistry Program
- Fire Protection Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.3 Standby Service Water Pump House 1A and 1B and Spray Pond 1A and 1B

Materials

Standby Service Water Pump House and Spray Pond structural components subject to AMR are constructed of the following materials:

- Carbon Steel
- Concrete
- Galvanized Steel
- Stainless Steel
- Teflon

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Standby Service Water Pump House and Spray Pond structural components subject to AMR are exposed to the following environments:

- Soil
- Air-indoor
- Air-outdoor
- Water-flowing
- Raw water

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Standby Service Water Pump House and Spray Pond structural components require management:

- Cracking
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Standby Service Water Pump House and Spray Pond structural components:

- Structures Monitoring Program – Water Control Structures Inspection
- Inservice Inspection (ISI) Program – IWF

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.4 Circulating Water Pump House

Materials

Circulating Water Pump House structural components subject to AMR constructed of the following materials:

- Carbon Steel
- Galvanized Steel
- Stainless Steel
- Concrete
- Concrete Block

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Circulating Water Pump House structural components subject to AMR are exposed to the following environments:

- Soil
- Air-indoor

- Air-outdoor
- Water-flowing

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Circulating Water Pump House structural components, require management:

- Cracking
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Circulating Water Pump House structural components:

- Structures Monitoring Program – Water Control Structures Inspection
- Structures Monitoring Program – Masonry Wall Inspection
- Fire Protection Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.5 Diesel Generator Building

Materials

Diesel Generator Building structural components subject to AMR are constructed of the following materials:

- Carbon Steel
- Galvanized Steel
- Concrete

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Diesel Generator Building structural components subject to AMR are exposed to the following environments:

- Soil
- Air-indoor
- Air-outdoor

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effect associated with the Diesel Generator Building structural components, requires management:

- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Diesel Generator Building structural components:

- Structures Monitoring Program
- Fire Protection Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.6 Fresh Air Intake Structure No. 1 and 2

Materials

Fresh Air Intake Structure No. 1 and 2 structural components subject to AMR are constructed of the following material:

- Concrete

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Fresh Air Intake Structure No. 1 and 2 structural components subject to AMR are exposed to the following environments:

- Soil
- Air-outdoor

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

There are no aging effects requiring management for the Fresh Air Intake Structure No. 1 and 2 structural components. However, the aging management program identified below will be used to confirm the absence of significant aging effects for the period of extended operation.

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following program is credited for managing the effects of aging on the Fresh Air Intake Structure No. 1 and 2 structural components:

- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.7 Makeup Water Pump House

Materials

Makeup Water Pump House structural components subject to AMR are constructed of the following materials:

- Carbon Steel
- Galvanized Steel
- Concrete

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Makeup Water Pump House structural components subject to AMR are exposed to the following environments:

- Soil
- Air-indoor
- Air-outdoor

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effect associated with the Makeup Water Pump House structural components, requires management:

- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following program is credited for managing the effects of aging on the Makeup Water Pump House structural components:

- Structures Monitoring Program – Water Control Structures Inspection

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.8 Radwaste Control Building

Materials

Radwaste Control Building structural components subject to AMR are constructed of the following materials:

- Carbon Steel
- Galvanized Steel
- Stainless Steel
- Concrete
- Concrete Block

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Radwaste Control Building structural components subject to AMR are exposed to the following environments:

- Soil
- Air-indoor
- Air-outdoor

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Radwaste Control Building structural components, require management:

- Change in material properties
- Cracking
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Radwaste Control Building structural components:

- Structures Monitoring Program
- Structures Monitoring Program – Masonry Wall Inspection
- Fire Protection Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.9 Service Building

Materials

Service Building structural components subject to AMR are constructed of the following materials:

- Carbon Steel
- Galvanized Steel

- Concrete

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Service Building structural components subject to AMR are exposed to the following environments:

- Soil
- Air-indoor
- Air-outdoor

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effect associated with the Service Building structural components, requires management:

- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following program is credited for managing the effects of aging on the Service Building structural components:

- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.10 Turbine Generator Building

Materials

Turbine Generator Building structural components subject to AMR are constructed of the following materials:

- Carbon Steel
- Galvanized Steel
- Stainless Steel

- Concrete
- Concrete Block
- Concrete Block or Brick (freestanding or stacked shield wall)

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Turbine Generator Building structural components subject to AMR are exposed to the following environments:

- Soil
- Air-indoor
- Air-outdoor
- Raw water

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Turbine Generator Building structural components, require management:

- Cracking
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Turbine Generator Building structural components:

- Structures Monitoring Program
- Structures Monitoring Program – Masonry Wall Inspection
- Fire Protection Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.11 Water Filtration Building

Materials

Water Filtration Building structural components subject to AMR are constructed of the following materials:

- Carbon Steel
- Galvanized Steel
- Concrete

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Water Filtration Building structural components subject to AMR are exposed to the following environments:

- Soil
- Air-indoor
- Air-outdoor

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effect associated with the Water Filtration Building structural components, requires management:

- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following program is credited for managing the effects of aging on the Water Filtration Building structural components:

- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.12 Yard Structures

Materials

Structural components of yard structures subject to AMR are constructed of the following materials:

- Aluminum
- Carbon Steel
- Galvanized Steel
- Concrete
- Earthen Structures

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Structural components of yard structures subject to AMR are exposed to the following environments:

- Soil
- Air-indoor
- Air-outdoor
- Raw water
- Water-flowing

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with structural components of evaluated yard structures require management:

- Cracking
- Loss of form
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following program is credited for managing the effects of aging on yard structures' structural components:

- Structures Monitoring Program
- Structures Monitoring Program – Water Control Structures Inspection

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.13 Bulk Commodities

Materials

Structural components of bulk commodities subject to AMR are constructed of the following materials:

- Aluminum
- Carbon Steel
- Concrete
- Elastomer
- Fire Barrier materials (Ceramic fiber/ Thermolag/ Darmatt/ 3M Interam)
- Fluoropolymer
- Galvanized Steel
- Insulation materials (Calcium Silicate/ Fiberglass/Aluminum jacketing/ Stainless Steel Mirror insulation)
- Lubrite
- Nylon
- Stainless Steel

Environments

Structural components of bulk commodities subject to AMR are exposed to the following environments:

- Air-indoor
- Air-outdoor
- Raw water
- Soil

- Treated water

Aging Effects Requiring Management

The following aging effects associated with structural components of evaluated bulk commodities require management:

- Change in material properties
- Cracking/delamination
- Loss of material
- Separation

Aging Management Programs

The following program is credited for managing the effects of aging on bulk commodities:

- BWR Water Chemistry Program
- Fire Protection Program
- Inservice Inspection (ISI) Program – IWF
- Structures Monitoring Program

3.5.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

For the Columbia containment, structures, and component supports, those items requiring further evaluation are addressed in the following sections.

3.5.2.2.1 PWR and BWR Containments

3.5.2.2.1.1 Aging of Inaccessible Concrete Areas

The Primary Containment is a free-standing steel pressure vessel. It utilizes the pressure suppression technique through the GE BWR Mark II over-under configuration. The concrete mat foundation under the suppression chamber is a common foundation supporting the steel primary containment vessel, including all equipment and structures therein, and the Reactor Building of which the primary containment vessel is a part. The primary containment vessel and the Reactor Building enclosing the primary containment vessel are both supported on a common, reinforced concrete mat foundation.

The Reactor Building foundation mat is not subject to flowing water. Seismic Category I structures and safety-related systems and components at Columbia are located above the present groundwater elevation 380 feet msl (mean sea level) and are not subject to any force effects of buoyancy and static water from this groundwater elevation. The bottom of the Reactor Building foundation mat is at elevation 400 feet 9 inches; therefore, foundation interaction with groundwater is unlikely.

The below-grade environment at Columbia is non-aggressive (Chlorides < 500 ppm, Sulfates < 1,500 ppm, and pH > 5.5) and has been confirmed by water chemistry analysis results. Sampling results indicate a groundwater pH minimum value of 6.9, chloride content maximum value of 36 ppm, and sulfate content maximum value of 323 ppm.

Primary Containment foundation concrete is designed in accordance with American Concrete Institute (ACI) 318-63 or 318-71 and constructed in accordance with ACI 301-66 or 301-72 using ingredients conforming to ACI and American Society for Testing and Materials (ASTM) standards. Concrete constructed to these criteria has a low water-to-cement ratio of less than 0.50 and an air entrainment between 3 and 6 percent and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77. (Note: Columbia does not specify water-to-cement ratio, however for massive concrete (sections more than 30 inches in the least dimension) a minimum slump of 1 inch and a maximum slump of 3 inches is provided so that the average for all batches or of the most recent 10 batches tested, whichever is lower, does not exceed 2-1/2 inches. Water-to-cement ratio is established by tests of trial mixes using the materials and slump proposed for use. The slump working limit at point of placement specified in design specification yields concrete with low water-to-cement ratio since the average slump at the point of placement is less than the working limit, which is the maximum slump for estimating the quantity of mixing water to be used in the concrete.)

The Primary Containment concrete is not exposed to an aggressive environment and the design and construction of the concrete is in accordance with accepted ACI Standards, thereby precluding aggressive chemical attack and embedded steel corrosion aging mechanisms.

Therefore, increases 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 Primary Containment concrete in inaccessible areas.

The absence of concrete aging effects is confirmed under the Structures Monitoring Program. The Inservice Inspection Program –IWL does not apply to Columbia since it is a BWR Mark II steel containment.

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

Cracking due to settlement is not an aging effect requiring management for concrete components below grade because the total differential settlement experienced in the past 20 years is well within the permissible limits for these types of structures and no settlement has manifested itself via cracked walls or cracked foundations. Foundations of all Columbia plant structures are supported on structural backfill. The backfill provides safe bearing for the structural foundations, and settlements are estimated to be minimal. In order to compare the calculated to actual settlement, measurement points were established at the corners of the substructure of the Reactor Building, Radwaste Control Building, Spray Ponds, and along the four sides of the sub-structure of the Turbine Generator Building. These points have been monitored systematically since the beginning of construction. The settlement observation records to date for these facilities are included in the FSAR, Appendix 2.5H. The results of settlement monitoring program show that the actual maximum differential settlements are well within the estimated differential settlements and that they remain of no consequence to the design of plant structures appurtenances. The measured settlement rate in the time frame from 1986 to 1991 has virtually leveled off (i.e., zero settlement) for the Reactor, Radwaste Control, and Turbine Generator buildings and was less than an average of 0.001 feet per year for both Spray Ponds. Therefore, commitments regarding settlement have been satisfied as any future settlements during the lifetime of the plant will not adversely affect the plant structures or appurtenances.

Columbia does not employ a de-watering system in any of the site structures for control of settlement since the groundwater level at the site is sufficiently lower than the deepest foundation in the complex. The Primary Containment base foundation is not constructed of porous concrete below-grade and is not subject to flowing water.

Therefore, cracks and distortion due to increased stress levels from settlement, and reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete are not applicable to the Primary Containment concrete subfoundations.

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. Normal temperature limits are given in FSAR Table 3.11-1. The temperature for the Primary Containment is maintained below 150 °F during normal operation, 135 °F bulk average maximum. The area beneath the RPV is a localized area with a maximum temperature limit of 165 °F, which is below the 200 ºF threshold for localized areas.

Piping contained in the Primary Containment is not in direct contact with concrete and the concrete temperature surrounding hot penetrations, such as the main steam line penetrations, is maintained at less than or equal to 200 ºF. Columbia specifications contain required insulation thicknesses for high temperature process piping. Consequently, localized hot spots on concrete are not expected from exposure to adjacent piping.

Therefore, reduction of strength and modulus of concrete due to elevated temperatures are not aging effects requiring management for the Primary Containment concrete components.

3.5.2.2.1.4 Loss of Material due to General, Pitting, and Crevice Corrosion

Loss of material due to corrosion in steel elements of accessible areas is managed by the Inservice Inspection (ISI) Program – IWE and the Appendix J Program. In addition to the Inservice Inspection (ISI) Program – IWE and the Appendix J Program, loss of material due to pitting and crevice corrosion for steel elements exposed to treated water (i.e., suppression chamber) is managed by the BWR Water Chemistry Program.

Loss of material due to corrosion in steel elements of inaccessible areas is not significant based on the following information.

The GE BWR Mark II steel Primary Containment is located within the Reactor Building and is protected from weather. The Primary Containment consists of an upper drywell and a lower suppression pool. The Primary Containment does not have boron reactivity control. The drywell and suppression pool atmosphere is inerted with nitrogen during normal operation. These are all positive influences for limiting loss of material due to corrosion in accessible and inaccessible areas.

The drywell floor peripheral seal is made of stainless steel and is welded to the primary containment vessel and to the underside of the circular closure girder embedded in the drywell floor. There are no concrete to metal moisture barriers at the drywell floor.

A sand filled pocket area is provided at the surrounding exterior of the primary containment vessel near the base. The sand filled pocket area is used to collect any drainage between the primary containment vessel exterior and the biological shield wall. An embedded steel closure ring is installed on the top of the sand filled transition area. Due to the possibility of containment shell degradation from corrosion induced by a moist environment in the sand pocket region, Columbia has committed to monitor humidity levels in this region. Columbia has implemented a procedure to survey the relative humidity of air drawn from within the containment annulus sand pocket region. [Reference NRC Accession Number ML042530061]

As a result of the design features and the committed surveillance indicated above, significant corrosion of inaccessible areas of the Primary Containment is not expected.

The continued monitoring of the drywell for loss material due to general, pitting, and crevice corrosion through the Inservice Inspection (ISI) Program – IWE and Appendix J Program provides reasonable assurance that loss of material in inaccessible areas of the drywell is insignificant and will be detected prior to the loss of an intended function.

3.5.2.2.1.5 Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature

The Primary Containment is a GE BWR Mark II steel containment design. There are no prestressed tendons associated with the Primary Containment design.

As a result of the Primary Containment design, loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperature is not an aging effect applicable to the Primary Containment.

3.5.2.2.1.6 Cumulative Fatigue Damage

This NUREG-1800 discussion involves metal fatigue of steel elements, such as containment penetration sleeves and bellows, vent lines, vent line bellows, vent header, and downcomers. The containment design includes penetrations, hatches, drywell head, downcomer vents, safety relief valve (SRV) discharge piping, and SRV quenchers. Containment process line penetrations are of welded steel construction without expansion bellows, gaskets, or sealing compounds and are an integral part of the construction.

Time-limited aging analyses are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4. Fatigue time-limited aging analyses are evaluated as documented in Section 4.6.

3.5.2.2.1.7 Cracking due to Stress Corrosion Cracking (SCC)

Stress corrosion cracking (SCC) requires a combination of a corrosive environment, susceptible materials, and high tensile stresses.

The primary containment penetrations are of welded steel construction without expansion bellows, gaskets, or sealing compounds and are an integral part of the construction. The penetration sleeves, vent headers, and downcomers are fabricated from carbon steel.

(1) SCC is not an applicable aging effect for the primary containment penetration sleeves, vent line headers, or downcomers because they are carbon steel components not susceptible to SCC.

(2) To be susceptible to SCC, stainless steel must be subject to both high temperature (>140 °F) and an aggressive chemical environment. SCC is not an applicable aging effect for dissimilar metal welds in the primary containment penetration sleeves since the welds are located inside the primary containment drywell or outside the drywell (within the Reactor Building), and are not subject to an aggressive chemical environment.

The Primary Containment is designed to permit appropriate periodic inspection of all penetrations. The design includes provisions for periodic testing at containment design pressure of the leaktightness of pressure containing or leakage limiting boundaries such as air locks, door seals, penetrations, drywell head, and access hatches.

A review of Columbia operating experience indicates that cracking due to SCC has not been a concern for the steel containment pressure boundary. As a result, cracking due to SCC is not applicable for the Primary Containment pressure boundary.

For the steel elements of containment that are part of the IWE pressure boundary; both the Inservice Inspection (ISI) Program - IWE and the Appendix J Program are used to monitor for degradation.

3.5.2.2.1.8 Cracking due to Cyclic Loading

Columbia penetrations do not use expansion bellows, and penetration sleeves are fabricated of carbon steel.

Cracking of metal components as a result of cyclic loads is a potential aging effect. However, review of the Columbia containment and associated operating experience concluded that cyclic loading from plant heatups and cooldowns, containment testing, and system vibration was very low or limited in numbers of cycles; and, therefore, additional methods of detecting postulated cracking are not warranted. Note that the cyclic loading of steel elements has been analyzed as a time-limited aging analysis; refer to Section 3.5.2.2.1.6 above.

For the steel elements of containment that are part of the IWE pressure boundary; both the Inservice Inspection (ISI) Program - IWE and the Appendix J Program are used to monitor for degradation. A review of Columbia operating experience indicates that cracking due to cyclic loading has not been a concern for steel containment pressure boundary components.

3.5.2.2.1.9 Loss of Material (Scaling, Cracking, and Spalling) due to Freeze-Thaw

The Primary Containment is a GE BWR Mark II steel containment design located within the Reactor Building. Loss of material (scaling, cracking, and spalling) due to freeze-thaw is applicable only to concrete containments exposed to weather.

Therefore, loss of material (scaling, cracking, and spalling) due to freeze-thaw is not an aging effect applicable to the Primary Containment.

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

Primary Containment concrete is designed in accordance with ACI 318-63 or 318-71 and constructed in accordance with ACI 301-66 or 301-72 using ingredients conforming to ACI and ASTM standards. Concrete constructed to these criteria has a low water-to-cement ratio of less than 0.50 and an air entrainment between 3 and 6 percent and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77. (Note: Columbia does not specify water-to-cement ratio, however for massive concrete (sections more than 30 inches in the least dimension) a minimum slump of 1 inch and a maximum slump of 3 inches is provided so that the average for all batches or of the most recent 10 batches tested, whichever is lower, does not exceed 2-1/2 inches. Water-to-cement ratio is established by tests of trial mixes using the materials and slump proposed for use. The slump working limit at point of placement specified in design specification yields concrete with low water-to-cement ratio since the average slump at the point of placement is less than the working limit, which is the maximum slump for estimating the quantity of mixing water to be used in the concrete.)

Columbia requires that concrete aggregates conform to ASTM C33 and that the potential reactivity of aggregates be acceptable based on testing in accordance with the Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method) (ASTM C227) or the Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method) (ASTM C289). Columbia specifications for concrete prohibit the use of calcium chloride in the concrete mix design.

Leaching of calcium hydroxide from reinforced concrete becomes significant only if the concrete is exposed to flowing water. Seismic Category I structures and safety-related systems and components at Columbia are located above the present groundwater elevation 380 feet msl (mean sea level) and are not subject to any force effects of buoyancy and static water from this groundwater elevation. The bottom of the Reactor Building foundation mat is at elevation 400 feet 9 inches; therefore, foundation interaction with groundwater is unlikely. The Primary Containment concrete is not exposed to flowing water and the design and construction of the Primary Containment concrete is in accordance with accepted ACI Standards, thereby precluding expansion and reaction with aggregate and leaching of calcium hydroxide aging mechanisms.

Therefore, cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide are not aging effects requiring management for primary concrete components.

The absence of concrete aging effects is confirmed under the Structures Monitoring Program.

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

The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components, in accordance with NRC position on managing concrete, even if the AMR did not identify aging effects requiring management. NRC Interim Staff Guidance (ISG)-3 for aging management of concrete elements determined that concrete structures and components that are in the scope of license renewal are subject to visual inspection for the period of extended operation. Accordingly, Columbia complies with the staff guidance and concrete structures and components that are in the scope of license renewal include an aging management program to provide confirmation of the absence of aging effects requiring management. Columbia concurs with Interim Staff Guidance ISG-3 that sound engineering practices during material (concrete mix) design and construction together with sound inspection programs, in which the performance and condition of plant structures are periodically evaluated and monitored, are both necessary to maintain the serviceability of concrete nuclear structures. Additional discussion of specific aging effects and mechanisms 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

Columbia concrete is designed in accordance with ACI 318-63 or 318-71 and constructed in accordance with ACI 301-66 or 301-72 using ingredients conforming to ACI and ASTM standards. Concrete constructed to these criteria has a low water-to-cement ratio of less than 0.50 and an air entrainment between 3 and 6 percent and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77. (Note: Columbia does not specify water-to-cement ratio, however for massive concrete (sections more than 30 inches in the least dimension) a minimum slump of 1 inch and a maximum slump of 3 inches is provided so that the average for all batches or of the most recent 10 batches tested, whichever is lower, does not exceed 2-1/2 inches. Water-to-cement ratio is established by tests of trial mixes using the materials and slump proposed for use. The slump working limit at point of placement specified in design specification yields concrete with low water-to-cement ratio since the average slump at the point of placement is less than the working limit, which is the maximum slump for estimating the quantity of mixing water to be used in the concrete.)

The below-grade environment is non-aggressive (Chlorides < 500 ppm, Sulfates < 1,500 ppm, and pH > 5.5) and has been confirmed by water chemistry analysis results. Sampling results indicated groundwater pH minimum value of 6.9, chloride content maximum value of 36 ppm, and sulfate content maximum value of 323 ppm.

Annual rain water data summary from the National Atmospheric Deposition Program/National Trends Network (sample well located in Columbia River Gorge Skamania County) indicates the pH of precipitation sampled was 5.4, which is mildly acidic. Concrete components exposed to air-outdoor has proper drainage and slope design that limits the duration that concrete is exposed to mildly acidic rain water. The external surfaces are not continuously wetted (annual precipitation only amounts to less than 7 inches) or exposed to an aggressive ambient environment (such as a saltwater atmosphere, sulfur dioxide, etc.) or industrial locations. Rain water results in exposure for only intermittent periods of time; therefore, its mildly acidic aggressiveness is non-significant.

The concrete components below grade are not exposed to an aggressive environment and the design and construction of the concrete is in accordance with accepted ACI Standards, thereby precluding embedded steel corrosion aging mechanism.

Therefore, cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not aging effects requiring management for the concrete structure components.

(2) Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack for Groups 1-5, 7, 9 structures

Columbia concrete is designed in accordance with ACI 318-63 or 318-71 and constructed in accordance with ACI 301-66 or 301-72 using ingredients conforming to ACI and ASTM standards. Concrete constructed to these criteria has a low water-to-cement ratio of less than 0.50 and an air entrainment between 3 and 6 percent and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77. (Note: Columbia does not specify water-to-cement ratio, however for massive concrete (sections more than 30 inches in the least dimension) a minimum slump of 1 inch and a maximum slump of 3 inches is provided so that the average for all batches or of the most recent 10 batches tested, whichever is lower, does not exceed 2-1/2 inches. Water-to-cement ratio is established by tests of trial mixes using the materials and slump proposed for use. The slump working limit at point of placement specified in design specification yields concrete with low water-to-cement ratio since the average slump at the point of placement is less than the working limit, which is the maximum slump for estimating the quantity of mixing water to be used in the concrete.)

The below-grade environment is non-aggressive (Chlorides < 500 ppm, Sulfates < 1,500 ppm, and pH > 5.5) and has been confirmed by water chemistry analysis results. Sampling results indicated groundwater pH minimum value of 6.9, chloride content maximum value of 36 ppm, and sulfate content maximum value of 323 ppm.

Annual rain water data summary from the National Atmospheric Deposition Program/National Trends Network (sample well located in Columbia River Gorge Skamania County) indicates the pH of precipitation sampled was 5.4, which is mildly acidic. Concrete components exposed to air-outdoor has proper drainage and slope design that limits the duration that concrete is exposed to mildly acidic rain water. The external surfaces are not continuously wetted (annual precipitation only amounts to less than 7 inches) or exposed to an aggressive ambient environment (such as a saltwater atmosphere, sulfur dioxide, etc.) or industrial locations. Rain water results in exposure for only intermittent periods of time; therefore, its mildly acidic aggressiveness is non-significant.

The concrete components below grade are not exposed to an aggressive environment and the design and construction of the concrete is in accordance with accepted ACI Standards thereby precluding aggressive chemical attack aging mechanism.

There are also aggressive chemicals stored at the plant and system leakage that could cause structural components to be exposed to chemicals is possible. However, accidental chemical spills are negligible since spills are cleaned up quickly in accordance with plant housekeeping procedures. System leakages are event driven and are not expected to continue for the extensive periods required for concrete degradation, and repairs would be made prior to loss of intended function.

Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack are not aging effects requiring management for concrete structure components below grade.

However, the Structures Monitoring Program will include review of site groundwater and raw water pH, chlorides, and sulfates in order to validate that the below-grade environment remains non-aggressive during the period of extended operation.

(3) Loss of material due to corrosion for Groups 1-5, 7, 8 structures

The Structures Monitoring Program is credited for aging management of loss of material due to corrosion for Columbia Groups 1-5, 7 and 8 structures. Tanks subject to AMR are evaluated with the respective mechanical systems. Tank anchorages are managed by the Structures Monitoring Program.

(4) Loss of material (spalling, scaling) and cracking due to freeze-thaw for Groups 1-3, 5, 7-9 structures

Columbia is located in an area where weathering conditions are moderate (weathering index 100 to 500 day-inch per year). The structures are designed with proper drainage and slope such that ponding or prolonged exposure to standing water on concrete surfaces is not significant.

Columbia concrete is designed in accordance with ACI 318-63 or 318-71 and constructed in accordance with ACI 301-66 or 301-72 using ingredients conforming to ACI and ASTM standards. Concrete constructed to these criteria has a low water-to-cement ratio of less than 0.50 and an air entrainment between 3 and 6 percent and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77. (Note: Columbia does not specify water-to-cement ratio, however for massive concrete (sections more than 30 inches in the least dimension) a minimum slump of 1 inch and a maximum slump of 3 inches is provided so that the average for all batches or of the most recent 10 batches tested, whichever is lower, does not exceed 2-1/2 inches. Water-to-cement ratio is established by tests of trial mixes using the materials and slump proposed for use. The slump working limit at point of placement specified in design specification yields concrete with low water-to-cement ratio since the average slump at the point of placement is less than the working limit, which is the maximum slump for estimating the quantity of mixing water to be used in the concrete, which results in good freeze-thaw and sulfate resistance.)

The design and construction of the concrete is in accordance with accepted ACI Standards that preclude freeze-thaw aging mechanism.

Therefore, loss of material (spalling, scaling) and cracking due to freeze-thaw are not aging effects requiring management for concrete structure components.

(Note that loss of material (spalling, scaling) and cracking due to freeze-thaw are aging effects requiring management for Columbia water control structures (Group 6 structures) exposed to raw water because the concrete located in water control structures may become saturated and therefore could be susceptible to freeze-thaw. Freeze-thaw on water control structures typically manifest near the water line; concrete component submerged in raw water (e.g., spray pond foundation) is not susceptible to freeze-thaw. Columbia plant operating experience has confirmed freeze-thaw degradation on concrete exposed to raw water.)

(5) Cracking due to expansion and reaction with aggregates for Groups 1-5, 7-9 structures

Columbia design specifications require that concrete aggregates conform to ASTM C33 and that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method) (ASTM C227) or Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method) (ASTM C289).

The design and construction of the concrete is in accordance with accepted ACI Standards that preclude the expansion and reaction with aggregate aging mechanism.

Therefore, cracking due to expansion and reaction with aggregates is not an aging effect requiring management for concrete structure components.

(6) Cracks and distortion due to increased stress levels from settlement for Groups 1-3, 5-9 structures

Cracking due to settlement is not an aging effect requiring management for concrete components below grade because the total differential settlement experienced in the past 20 years is well within the permissible limits for these types of structures and no settlement has manifested itself via cracked walls or cracked foundations. Foundations of all Columbia plant structures are supported on structural backfill. The backfill provides safe bearing for the structural foundations, and settlements are estimated to be minimal. In order to compare the calculated to actual settlement, measurement points were established at the corners of the substructure of the Reactor Building, Radwaste Control Building, Spray Ponds, and along the four sides of the sub-structure of the Turbine Generator Building. These points have been monitored systematically since the beginning of construction. The settlement observation records to date for these facilities are included in the FSAR, Appendix 2.5H. The results of settlement monitoring program show that the actual maximum differential settlements are well within the estimated differential settlements and that they remain of no consequence to the design of plant structures appurtenances. The measured settlement rate in the time frame from 1986 to 1991 has virtually leveled off (i.e., zero settlement) for the Reactor, Radwaste Control, and Turbine Generator buildings and was less than an average of 0.001 feet per year for both Spray Ponds. Therefore, commitments regarding settlement have been satisfied as any future settlements during the lifetime of the plant will not adversely affect the plant structures or appurtenances.

Columbia does not employ a de-watering system in any of the site structures for control of settlement since the groundwater level at the site is sufficiently lower than the deepest foundation in the complex.

Therefore, cracks and distortion due to increased stress levels from settlement are not aging effects requiring management for the concrete structural components.

(7) Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation for Groups 1-3, 5-9 structures

The concrete foundations are not constructed with porous concrete and are not subject to flowing water. Columbia does not employ a de-watering system at any of the site structures for control of settlement.

Therefore, reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations are not aging effects requiring management for the concrete foundations.

(8) Lock up due to wear could occur for Lubrite radial beam seats in BWR drywell, Reactor Pressure Vessel support shoes for PWR with nozzle supports, steam generator supports, and other sliding support bearings and sliding support surfaces

Lubrite plates are provided in certain situations to reduce friction on sliding support assemblies in Columbia in-scope structural components. They are used in association with such components as the radial beam seat connections on the vessel shell high temperature piping supports. Lubrite® is the trade name for a low friction lubricant material used in applications where relative motion (sliding) is desired. The Lubrite proprietary lubricant is a custom compound mixture of metals, metal oxides, minerals, and other lubricating materials combined with a lubricating binder. Lubrite material resists deformation, has a low coefficient of friction, resists softening at elevated temperatures, absorbs grit and abrasive particles, is not susceptible to corrosion, withstands high intensities of radiation, and will not score or mar. Additionally, Lubrite products are solid, permanent, completely self lubricating, and require no maintenance. The Lubrite lubricants used in nuclear applications are designed for the environments to which they are exposed. There are no known aging effects that would lead to a loss of intended function. Review of plant-specific operating experience identified no occurrences of Lubrite degradations. Therefore, there are no aging effects requiring management for Lubrite plates.

However, aging degradations of supports designed with or without sliding connections are managed by the Inservice Inspection (ISI) Program – IWF and the Structures Monitoring Program.

3.5.2.2.2.2 Aging Management of Inaccessible Areas

3.5.2.2.2.2.1 Below-Grade Inaccessible Concrete Areas – Freeze-Thaw

Columbia is located in an area where weathering conditions are moderate (weathering index 100 to 500 day-inch per year). The structures are designed with proper drainage and slope such that ponding or prolonged exposure to standing water on concrete surfaces is not significant.

Columbia concrete is designed in accordance with ACI 318-63 or 318-71 and constructed in accordance with ACI 301-66 or 301-72 using ingredients conforming to ACI and ASTM standards. Concrete constructed to these criteria has a low water-to-cement ratio of less than 0.50 and an air entrainment between 3 and 6 percent and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77. (Note: Columbia does not specify water-to-cement ratio, however for massive concrete (sections more than 30 inches in the least dimension) a minimum slump of 1 inch and a maximum slump of 3 inches is provided so that the average for all batches or of the most recent 10 batches tested, whichever is lower, does not exceed 2-1/2 inches. Water-to-cement ratio is established by tests of trial mixes using the materials and slump proposed for use. The slump working limit at point of placement specified in design specification yields concrete with low water-to-cement ratio since the average slump at the point of placement is less than the working limit, which is the maximum slump for estimating the quantity of mixing water to be used in the concrete, which results in good freeze-thaw and sulfate resistance.)

The design and construction of the concrete is in accordance with accepted ACI Standards that preclude freeze-thaw aging mechanism.

Therefore, loss of material (spalling, scaling) and cracking due to freeze-thaw are not aging effects requiring management for the below-grade inaccessible concrete components.

The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components, in accordance with NRC position on managing concrete, even if the AMR did not identify aging effects requiring management. The Structures Monitoring Program will include examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation.

3.5.2.2.2.2.2 Below-Grade Inaccessible Concrete Areas – Expansion and Reaction with Aggregates

Columbia design specifications require that concrete aggregates conform to ASTM C33 and that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method) (ASTM C227) or Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method) (ASTM C289).

The design and construction of the concrete is in accordance with accepted ACI Standards thereby precluding the expansion and reaction with aggregate aging mechanism.

Therefore, cracking due to expansion and reaction with aggregates is not an aging effect requiring management for the below-grade inaccessible concrete components.

The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components, in accordance with the NRC position on managing concrete, even if the AMR did not identify aging effects requiring management. The Structures Monitoring Program will include examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation.

3.5.2.2.2.2.3 Below-Grade Inaccessible Concrete Areas – Settlement and Erosion

Cracking due to settlement is not an aging effect requiring management for concrete components below grade because the total differential settlement experienced in the past 20 years is well within the permissible limits for these types of structures and no settlement has manifested itself via cracked walls or cracked foundations. Foundations of all Columbia plant structures are supported on structural backfill. The backfill provides safe bearing for the structural foundations, and settlements are estimated to be minimal. In order to compare the calculated to actual settlement, measurement points were established at the corners of the substructure of the Reactor Building, Radwaste Control Building, Spray Ponds, and along the four sides of the sub-structure of the Turbine Generator Building. These points have been monitored systematically since the beginning of construction. The settlement observation records to date for these facilities are included in the FSAR, Appendix 2.5H. The results of the settlement monitoring program show that the actual maximum differential settlements are well within the estimated differential settlements and that they remain of no consequence to the design of plant structures appurtenances. The measured settlement rate in the time frame from 1986 to 1991 has virtually leveled off (i.e., zero settlement) for the Reactor, Radwaste Control, and Turbine Generator buildings and was less than an average of 0.001 feet per year for both Spray Ponds. Therefore, commitments regarding settlement have been satisfied as any future settlements during the lifetime of the plant will not adversely affect the plant structures or appurtenances.

Columbia does not employ a de-watering system in any of the site structures for control of settlement since the groundwater level at the site is sufficiently lower than the deepest foundation in the complex.

Therefore, cracks and distortion due to increased stress levels from settlement and reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations are not aging effects requiring management for the below-grade inaccessible concrete components.

The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components, in accordance with the NRC position on managing concrete, even if the AMR did not identify aging effects requiring management. The Structures Monitoring Program will include examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation.

3.5.2.2.2.2.4 Below-Grade Inaccessible Concrete Areas – Aggressive Chemical Attack and Corrosion of Embedded Steel

Columbia concrete is designed in accordance with ACI 318-63 or 318-71 and constructed in accordance with ACI 301-66 or 301-72 using ingredients conforming to ACI and ASTM standards. Concrete constructed to these criteria has a low water-to-cement ratio of less than 0.50 and an air entrainment between 3 and 6 percent and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77. (Note: Columbia does not specify water-to-cement ratio, however for massive concrete (sections more than 30 inches in the least dimension) a minimum slump of 1 inch and a maximum slump of 3 inches is provided so that the average for all batches or of the most recent 10 batches tested, whichever is lower, does not exceed 2-1/2 inches. Water-to-cement ratio is established by tests of trial mixes using the materials and slump proposed for use. The slump working limit at point of placement specified in design specifications yields concrete with a low water-to-cement ratio since the average slump at the point of placement is less than the working limit, which is the maximum slump for estimating the quantity of mixing water to be used in the concrete.)

The below-grade environment is non-aggressive (Chlorides < 500 ppm, Sulfates < 1,500 ppm, and pH > 5.5) and has been confirmed by water chemistry analysis results. Sampling results indicate a groundwater pH minimum value of 6.9, chloride content maximum value of 36 ppm, and sulfate content maximum value of 323 ppm.

The concrete components below grade are not exposed to an aggressive environment and the design and construction of the concrete is in accordance with accepted ACI Standards, thereby precluding the aggressive chemical attack and embedded steel corrosion aging mechanisms.

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 aging effects requiring management for the below-grade inaccessible concrete components.

The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components, in accordance with the NRC position on managing concrete, even if the AMR did not identify aging effects requiring management. The Structures Monitoring Program will include review of site groundwater and raw water pH, chlorides, and sulfates in order to validate that the below-grade environment remains non-aggressive during the period of extended operation and will include examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation.

3.5.2.2.2.2.5 Below-Grade Inaccessible Concrete Areas – Leaching of Calcium Hydroxide

Columbia concrete is designed in accordance with ACI 318-63 or 318-71 and constructed in accordance with ACI 301-66 or 301-72 using ingredients conforming to ACI and ASTM standards. Concrete constructed to these criteria has a low water-to-cement ratio of less than 0.50 and an air entrainment between 3 and 6 percent and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77. (Note: Columbia does not specify water-to-cement ratio, however for massive concrete (sections more than 30 inches in the least dimension) a minimum slump of 1 inch and a maximum slump of 3 inches is provided so that the average for all batches or of the most recent 10 batches tested, whichever is lower, does not exceed 2-1/2 inches. Water-to-cement ratio is established by tests of trial mixes using the materials and slump proposed for use. The slump working limit at point of placement specified in design specifications yields concrete with low water-to-cement ratio since the average slump at the point of placement is less than the working limit, which is the maximum slump for estimating the quantity of mixing water to be used in the concrete.)

Leaching of calcium hydroxide from reinforced concrete becomes significant only if the concrete is exposed to flowing water.

The concrete components below grade are not exposed to flowing water and the design and construction of the concrete is in accordance with accepted ACI Standards, thereby precluding the leaching of calcium hydroxide aging mechanism. Groundwater hydraulic pressure is not a concern at Columbia. Seismic Category I structures and safety-related systems and components are located above the present groundwater elevation 380 feet msl (mean sea level) and are not subject to any force effects of buoyancy and static water from this groundwater elevation. The lowest structure foundation mat, for the Reactor Building, is at elevation 400 feet 9 inches, which is approximately 20 feet above the groundwater table elevation.

Therefore, increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide are not aging effects requiring management for the below-grade inaccessible concrete components.

3.5.2.2.2.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

Columbia in-scope concrete structures and concrete components are not exposed to temperature limits associated with aging degradation due to elevated temperature. The general air temperatures in safety-related and other structures are maintained below the 150 ºF threshold for these aging effects to be applicable. Normal temperature limits are given in FSAR Table 3.11-1. The area beneath the Reactor Pressure Vessel is a localized area and has a maximum temperature limit of 165 °F, which is below the 200 ºF threshold for localized areas.

Piping contained in these structures is not in direct contact with concrete and the concrete temperature surrounding hot penetrations such as the main steam line penetrations in the main steam tunnel is maintained at less than or equal to 200 ºF. Columbia specifications contain required insulation thicknesses for high temperature process piping. Consequently, localized hot spots on concrete are not expected from exposure to adjacent piping.

Therefore, reduction of strength and modulus of concrete due to elevated temperatures are not aging effects requiring management for the concrete components.

3.5.2.2.2.4 Aging Management of Inaccessible Areas for Group 6 Structures

3.5.2.2.2.4.1 Below-Grade Inaccessible Concrete Areas – Aggressive Chemical Attack and Corrosion of Embedded Steel

The Structures Monitoring Program – Water Control Structures Inspection is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components, in accordance with the NRC position on managing concrete, even if the AMR did not identify aging effects requiring management. Corrosion of structural steel components is addressed by the Structures Monitoring Program. Additional discussion of specific aging effects follows.

The ultimate heat sink consists of two Spray Ponds and two Standby Service Water Pump Houses. The water control structures are the Spray Ponds, Standby Service Water Pump Houses, Circulating Water Pump House (including circulating water basin), Makeup Water Pump House, and the cooling tower basins.

The below-grade environment is non-aggressive (Chlorides < 500 ppm, Sulfates < 1,500 ppm, and pH > 5.5) and has been confirmed by water chemistry analysis results. Sampling results indicate a groundwater pH minimum value of 6.9, chloride content maximum value of 36 ppm, and sulfate content maximum value of 323 ppm. Raw water sampling results indicate a raw water pH minimum value of 6.6, chloride content maximum value of 60 ppm, and sulfate content maximum value of 127 ppm.

Columbia concrete is designed in accordance with ACI 318-63 or 318-71 and constructed in accordance with ACI 301-66 or 301-72 using ingredients conforming to ACI and ASTM standards. Concrete constructed to these criteria has a low water-to-cement ratio of less than 0.50 and an air entrainment between 3 and 6 percent and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77. (Note: Columbia does not specify water-to-cement ratio, however for massive concrete (sections more than 30 inches in the least dimension) a minimum slump of 1 inch and a maximum slump of 3 inches is provided so that the average for all batches or of the most recent 10 batches tested, whichever is lower, does not exceed 2-1/2 inches. Water-to-cement ratio is established by tests of trial mixes using the materials and slump proposed for use. The slump working limit at point of placement specified in design specification yields concrete with low water-to-cement ratio since the average slump at the point of placement is less than the working limit, which is the maximum slump for estimating the quantity of mixing water to be used in the concrete.)

The water control structure's concrete is not exposed to an aggressive environment and the design and construction of the concrete is in accordance with accepted ACI Standards, thereby precluding the aggressive chemical attack and embedded steel corrosion aging mechanisms.

Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel are not aging effects requiring management for the water control structure's concrete.

The absence of concrete aging effects is confirmed under the Structures Monitoring Program.

3.5.2.2.2.4.2 Below-Grade Inaccessible Concrete Areas – Freeze-Thaw

Loss of material (spalling, scaling) and cracking due to freeze-thaw are aging effects requiring management for concrete components exposed to raw water because the concrete located in water control structures may become saturated and therefore could be susceptible to freeze-thaw. Concrete components submerged in raw water (e.g., spray pond foundation) are not susceptible to freeze-thaw. The Structures Monitoring Program – Water Control Structures Inspection is credited for monitoring degradation of the Spray Ponds, Standby Service Water Pump Houses, Circulating Water Pump House (including circulating water basin), Makeup Water Pump House, and the cooling tower basins. The Structures Monitoring Program will be enhanced to include examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation.

3.5.2.2.2.4.3 Below-Grade Inaccessible Concrete Areas – Expansion and Reaction with Aggregate and Leaching of Calcium Hydroxide

Columbia design specifications require that concrete aggregates conform to ASTM C33 and that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method) (ASTM C227) or Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method) (ASTM C289).

Leaching of calcium hydroxide from reinforced concrete becomes significant only if the concrete is exposed to flowing water.

The water control structures are exposed to flowing water, however the design and construction of the concrete is in accordance with accepted ACI Standards, thereby precluding the expansion and reaction with aggregate and leaching of calcium hydroxide aging mechanisms. Groundwater hydraulic pressure is not a concern at Columbia. Seismic Category I structures and safety-related systems and components are located above the present groundwater elevation 380 feet msl (mean sea level) and are not subject to any force effects of buoyancy and static water from this groundwater elevation. The foundation slab at the bottom of the Standby Service Water Pump House pump chambers where it intersects the spray pond foundation is at elevation 404 feet 9 inches, which is approximately 24 feet above the groundwater table elevation.

Therefore, cracking due to expansion and reaction with aggregate, and increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide are not aging effects requiring management for the below-grade concrete structures.

The Structures Monitoring Program – Water Control Structures Inspection is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components, in accordance with the NRC position on managing concrete, even if the AMR did not identify aging effects requiring management. The Structures Monitoring Program will be enhanced to include examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation.

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 reviews for aging management. Tanks subject to AMR are evaluated with the respective mechanical systems.

3.5.2.2.2.6 Aging of Supports Not Covered by Structures Monitoring Program

(1) Loss of material due to general and pitting corrosion for Groups B2-B5 supports

Loss of material due to general and pitting corrosion for Groups B2-B5 supports is managed by the Structures Monitoring Program.

(2) Reduction in concrete anchor capacity due to degradation of the surrounding concrete, for Groups B1-B5 supports

Cracking due to service-induced vibration or fatigue that causes a reduction in concrete anchor capacity is not an aging effect requiring management because Columbia concrete support components are not subject to significant cyclic loading. Reinforced concrete components are designed by the strength method per ACI 318 and structural steel components are designed by the working stress method per American Institute of Steel Construction (AISC) specification, resulting in good, low cycle fatigue properties. Failures from high cycle fatigue due to equipment vibration loads are detected early in plant life and actions would be taken to prevent reoccurrence. At Columbia, connections for supports of running machinery or other high vibration environmental applications are designed as a slip-critical connection. Vibratory and rotating equipment are supported by cast-in-place, through bolted, or grouted-in anchors. Therefore, cracking due to fatigue at locations of cast-in-place, through bolted, or grouted-in anchors is not an aging effect requiring management.

The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components, in accordance with the NRC position on managing concrete, even if the AMR did not identify aging effects requiring management.

(3) Reduction or loss of isolation function due to degradation of vibration isolation elements for Group B4 supports

Vibration isolation elements are not used on Columbia's vibratory and rotating equipment such as pumps, compressors, or air handling units. However, vibration isolators are used on certain control panels within skid mounted complex assemblies such as the diesel engine. These components are treated as sub component (e.g., panels, pipe supports, heat exchanger supports, engine anchorages, instrumentation supports on the diesel engine skid) to the host component and are managed as part of the host component during Structures Monitoring Program inspections. Degradation of vibration isolation elements for Group B4 supports is managed by the Structures Monitoring Program.

3.5.2.2.2.7 Cumulative Fatigue Damage Due to Cyclic Loading

Time-limited aging analyses are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4. During the process of identifying time-limited aging analyses in the current licensing basis, no fatigue analyses were identified for component support members, anchor bolts, or welds for Groups B1.1, B1.2, and B1.3.

3.5.2.2.3 Quality Assurance for Aging Management of Non-safety Related Components

Quality Assurance provisions applicable to license renewal are discussed in Appendix B, Section B.1.3.

3.5.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the Containments, Structures, and Component Supports commodities. The section of the application that contains the time-limited aging analysis review results is indicated in parentheses.

- Metal Fatigue (Section 4.6, Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analyses)

3.5.3 Conclusions

The Containments, Structures, and Component Supports subject to AMR 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, 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 Containments, Structures, and Component Supports 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

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
PWR Concrete (Reinforced and Prestressed) and Steel Containments BWR Concrete and Steel (Mark I, II, and III) Containments					
3.5.1-01	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 the environment is non-aggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes, plant-specific, if the environment is aggressive	The Primary Containment concrete is not exposed to an aggressive environment and the design and construction of the concrete is in accordance with accepted ACI Standards, thereby precluding aggressive chemical attack and embedded steel corrosion aging mechanisms. Refer to Section 3.5.2.2.1.1 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-02	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 for Columbia. Columbia does not employ a de-watering system in any of the site structures for control of settlement. The total differential settlement experienced in the past 20 years is well within the permissible limits for these types of structures and no settlement has manifested itself via cracked walls or cracked foundations, therefore, this aging mechanism is not applicable. Refer to Section 3.5.2.2.1.2 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-03	Concrete elements: foundation, sub-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 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	The Primary Containment base foundation slabs are not constructed of porous concrete below-grade and are not subject to flowing water, thereby precluding these aging effects and mechanisms. Columbia does not employ a de-watering system at any of the site structures for control of settlement or erosion of cement from concrete subfoundations. Refer to Section 3.5.2.2.1.2 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-04	Concrete elements: dome, wall, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable)	Reduction of strength and modulus of concrete due to elevated temperature	A plant-specific aging management program is to be evaluated	Yes, plant-specific if temperature limits are exceeded	The temperature for the Primary Containment is maintained below 150 °F during normal operation, 135 °F bulk average maximum. The area beneath the RPV is a localized area and has a maximum temperature limit of 165 °F which is below the 200 ºF threshold for localized area. Piping contained in the Primary Containment is not in direct contact with concrete and the concrete temperature surrounding hot penetrations such as the main steam line penetrations is maintained at less than or equal to 200 ºF. These are below the threshold temperatures for these aging effects to be applicable. Refer to Section 3.5.2.2.1.3 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-05	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), and10 CFR Part 50, Appendix J.	Yes, if corrosion is significant for inaccessible areas	Consistent with NUREG-1801. Loss of material due to corrosion in steel elements is managed by the Inservice Inspection (ISI) Program – IWE and the Appendix J Program. In addition, loss of material due to pitting and crevice corrosion for steel elements exposed to treated water (i.e., suppression chamber) is managed by the BWR Water Chemistry Program. Refer to Section 3.5.2.2.1.4 for further information.
3.5.1-06	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 for Columbia. The Primary Containment is a GE BWR Mark II steel containment design. This table item pertains to PWR steel containments and BWR Mark III concrete containments.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-07	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 for Columbia. The Primary Containment is a GE BWR Mark II steel containment design. There are no prestressed tendons associated with the Primary Containment design. Refer to Section 3.5.2.2.1.5 for further information.
3.5.1-08	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	TLAAs are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4. Fatigue TLAAs are evaluated as documented in Section 4.6. Refer to Section 3.5.2.2.1.6 for further information.
3.5.1-09	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	TLAAs are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4. Fatigue TLAAs are evaluated as documented in Section 4.6. Refer to Section 3.5.2.2.1.6 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-10	Stainless steel penetration sleeves, penetration bellows, dissimilar metal welds	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examinations/evaluations for bellows assemblies and dissimilar metal welds.	Yes, detection of aging effects is to be evaluated	Not applicable for Columbia. The primary containment penetrations are of welded steel construction without expansion bellows, gaskets, or sealing compounds and are an integral part of the construction. The penetration sleeves, vent headers and downcomers are fabricated from carbon steel. A review of Columbia operating experience indicates that cracking due to SCC has not been a concern for steel containment pressure boundary. Cracking due to SCC is not applicable for the primary containment pressure boundaries. Refer to Section 3.5.2.2.1.7 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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 for Columbia. The Primary Containment is a GE BWR Mark II steel containment design. There are no stainless steel vent line bellows associated with the Primary Containment design. Refer to Section 3.5.2.2.1.7 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-12	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cracking due to cyclic loading	ISI (IWE) and 10 CFR Part 50, Appendix J, and supplemented to detect fine cracks	Yes, detection of aging effects is to be evaluated	Not applicable for Columbia. Columbia penetrations do not use expansion bellows and penetration sleeves are fabricated of carbon steel. The AMR, as supported by operating experience, concluded that cyclic loading from plant heatups and cooldowns, containment testing, and from system vibration was very low or limited in numbers of cycles; therefore, additional methods of detecting postulated cracking are not warranted. This aging effect and mechanism is not applicable. Refer to Section 3.5.2.2.1.8 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, and supplemented to detect fine cracks	Yes, detection of aging effects is to be evaluated	Not applicable for Columbia. The AMR, as supported by operating experience, concluded that cyclic loading from plant heatups and cooldowns, containment testing, and from system vibration was very low or limited in numbers of cycles; therefore, additional methods of detecting postulated cracking are not warranted. This aging effect and mechanism is not applicable. Refer to Section 3.5.2.2.1.8 for further information.
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 inaccessible areas of plants located in moderate to severe weathering conditions	Not applicable for Columbia. The Primary Containment is a GE BWR Mark II steel containment design located within the Reactor Building. This aging effect and mechanism is not applicable. Refer to Section 3.5.2.2.1.9 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.	Yes, if concrete was not constructed as stated for inaccessible areas	The design and construction of the Columbia concrete is in accordance with accepted ACI Standards. Cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide are not aging effects requiring management for the Primary Containment concrete components. The absence of concrete aging effects is confirmed under the Structures Monitoring Program. Refer to Section 3.5.2.2.1.10 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	Consistent with NUREG-1801. The subject aging effects are a result of cracking and change in material properties. Seals and gaskets for personnel airlock, equipment hatch and CRD hatch are evaluated with the host component. See Item Number 3.5.1-17. The Inservice Inspection (ISI) Program - IWE and the Appendix J Program are used to manage the aging effects of cracking and change in material properties which result in loss of sealing and leakage through containment. The drywell floor peripheral seal is made of stainless steel and is welded to the primary containment vessel and to the underside of the circular closure girder embedded in the drywell floor. There are no elastomeric moisture barrier seals in the drywell floor design.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801. Locks, hinges and closure mechanisms are evaluated with the host component. The personnel airlock, equipment hatch and CRD removal hatch are managed by the Inservice Inspection (ISI) Program - IWE and the Appendix J Program. Plant Technical Specification ensures that access airlocks maintain leak tightness in the closed position.
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	Consistent with NUREG-1801. The listed components are managed by the Inservice Inspection (ISI) Program - IWE and the Appendix J Program.
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 for Columbia. The Primary Containment is a GE BWR Mark II steel containment design. The suppression chamber is constructed of carbon steel.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 for Columbia. The Primary Containment is a GE BWR Mark II steel containment design. This table item pertains to BWR Mark I and BWR Mark II concrete containments.
3.5.1-21	Steel elements: drywell head and downcomer pipes	Fretting or lock up due to mechanical wear	ISI (IWE)	No	Columbia's plant operating experience has not identified fretting or lock up due to mechanical wear for the drywell head and downcomer pipes. The downcomer pipes are embedded in and supported by the reinforced concrete slab of the drywell floor.
3.5.1-22	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion	ISI (IWL)	No	Not applicable for Columbia. Columbia is not a prestressed containment. There are no tendons associated with the Primary Containment design.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structural components, in accordance with the current NRC position, even if the AMR did not identify aging effects requiring management. Refer to Section 3.5.2.2.2.1 for further information.
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	The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structural components, in accordance with the current NRC position, even if the AMR did not identify aging effects requiring management. Refer to Section 3.5.2.2.2.1 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. The Structures Monitoring Program is credited for aging management of this aging effect and mechanism. The effect of coating debris on ECCS pump suction strainers has been evaluated to have no safety impact on strainer operation (see FSAR Section 6.1.2). Containment coatings are subject to ongoing oversight that addresses their current status and will continue to address their status over the period of license renewal. Protective coatings are not relied upon to manage the effects of aging at Columbia. Refer to Section 3.5.2.2.2.1 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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 inaccessible areas of plants located in moderate to severe weathering conditions	The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structural components, in accordance with the current NRC position, even if the AMR did not identify aging effects requiring management. Refer to Section 3.5.2.2.2.1 for further information. Refer to Section 3.5.2.2.2.2.1 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structural components, in accordance with the current NRC position, even if the AMR did not identify aging effects requiring management. Refer to Section 3.5.2.2.2.1 for further information. The design and construction of the Columbia concrete is in accordance with accepted ACI Standards, thereby precluding the reaction with aggregates aging mechanism. Refer to Section 3.5.2.2.2.2.2 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structural components, in accordance with the current NRC position, even if the AMR did not identify aging effects requiring management. Refer to Section 3.5.2.2.2.1 for further information. Columbia does not employ a de-watering system at any of the site structures for control of settlement. Refer to Section 3.5.2.2.2.2.3 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	Not applicable for Columbia. The concrete foundations at Columbia are not constructed with porous concrete and are not subject to flowing water. Refer to Section 3.5.2.2.2.1 for further information. Columbia does not employ a de-watering system at any of the site structures for control of settlement. Refer to Section 3.5.2.2.2.1 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	Aging degradations of supports designed with or without sliding connections are managed by the Inservice Inspection (ISI) Program – IWF and the Structures Monitoring Program. The inspection criteria for supports within the programs effectively envelope misalignment and accumulation of debris. Lubrite material resists deformation, has a low coefficient of friction, resists softening at elevated temperatures, absorbs grit and abrasive particles, is not susceptible to corrosion, withstands high intensities of radiation, and will not score or mar. The Lubrite lubricants used in nuclear applications are designed for the environments to which they are exposed. There are no known aging effects that would lead to a loss of intended function. Refer to Section 3.5.2.2.2.1 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structural components, in accordance with the current NRC position, even if the AMR did not identify aging effects requiring management. The Structures Monitoring Program will include review of site ground water and raw water pH, chlorides, and sulfates in order to validate that the below-grade environment remains non-aggressive during the period of extended operation and will include examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation. Refer to Section 3.5.2.2.2.2.4 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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, and 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	The design and construction of the Columbia concrete is in accordance with accepted ACI Standards, thereby precluding the leaching of calcium hydroxide aging mechanism. Columbia concrete is not exposed to flowing water or groundwater hydraulic pressure, therefore, these aging effects and mechanisms do not require management for the below-grade inaccessible concrete structural components. Refer to Section 3.5.2.2.2.2.5 for further information.
3.5.1-33	Groups 1-5: concrete	Reduction of strength and modulus of concrete due to elevated temperature	A plant-specific aging management program is to be evaluated.	Yes, plant-specific if temperature limits are exceeded	Columbia in-scope concrete structures and concrete components are not exposed to temperature limits associated with aging degradation due to elevated temperature. Refer to Section 3.5.2.2.2.3 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs and for inaccessible concrete, an 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	The Columbia Group 6 structures concrete is not exposed to an aggressive environment and the design and construction of the concrete is in accordance with accepted ACI Standards, thereby precluding aggressive chemical attack and embedded steel corrosion aging mechanisms. The absence of concrete aging effects is confirmed under the Structures Monitoring Program – Water Control Structures Inspection. Columbia is not committed to Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. The Structures Monitoring Program encompasses and implements the Water Control Structures Inspection. Refer to Section 3.5.2.2.2.4.1 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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 inaccessible areas of plants located in moderate to severe weathering conditions	The Structures Monitoring Program – Water Control Structures Inspection is credited for aging management and includes the 10 elements evaluation for the NUREG-1801 XI.S7 aging management program. Columbia is not committed to Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. The Structures Monitoring Program encompasses and implements the Water Control Structures Inspection. Loss of material (spalling, scaling) and cracking due to freeze-thaw are aging effects requiring management for concrete components exposed to raw water because the concrete may become saturated and therefore could be susceptible to freeze-thaw. Refer to Section 3.5.2.2.2.4.2 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	The design and construction of the Columbia concrete is in accordance with accepted ACI Standards, thereby precluding the expansion and reaction with aggregate aging mechanism. The absence of concrete aging effects is confirmed under the Structures Monitoring Program – Water Control Structures Inspection. The Structures Monitoring Program includes the 10 elements evaluation for the NUREG-1801 XI.S7 aging management program. Columbia is not committed to Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. The Structures Monitoring Program encompasses and implements the Water Control Structures Inspection. Refer to Section 3.5.2.2.2.4.3 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	The design and construction of the Columbia concrete is in accordance with accepted ACI Standards, thereby precluding leaching of calcium hydroxide aging mechanisms. The absence of concrete aging effects is confirmed under the Structures Monitoring Program – Water Control Structures Inspection. The Structures Monitoring Program includes the 10 elements evaluation for the NUREG-1801 XI.S7 aging management program. Columbia is not committed to Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. The Structures Monitoring Program encompasses and implements the Water Control Structures Inspection. Refer to Section 3.5.2.2.2.4.3 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-38	Groups 7, 8: Tank liners	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated	Yes, plant specific	No tanks with stainless steel liners are included in the structural AMRs. Tanks subject to AMR are evaluated with their respective mechanical systems. Refer to Section 3.5.2.2.2.5 for further information.
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. Loss of material due to general and pitting corrosion for Groups B2-B5 supports is managed by the Structures Monitoring Program. Refer to Section 3.5.2.2.2.6 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structural components, in accordance with the current NRC position, even if the AMR did not identify aging effects requiring management. Refer to Section 3.5.2.2.2.6 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-41	Vibration isolation elements	Reduction or loss of isolation function/radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Degradation of vibration isolation elements for Group B4 supports is managed by the Structures Monitoring Program. Vibration isolation elements are not used on Columbia's vibratory and rotating equipment such as pumps, compressors, or air handling units. However, vibration isolators are used on certain control panels within skid mounted complex assemblies such as the diesel engine. These components are treated as sub component to the host component and are managed as part of the host component during Structures Monitoring Program inspections. Refer to Section 3.5.2.2.2.6 for further information.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No fatigue analyses were identified for component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3. Refer to Section 3.5.2.2.2.7 for further information.
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	Masonry block walls are managed by the Structures Monitoring Program – Masonry Wall Inspection. The Structures Monitoring Program includes the 10 elements evaluation for the NUREG-1801 XI.S5 aging management program. Masonry block walls with a fire barrier intended function are also managed by the Fire Protection Program. The Structures Monitoring Program encompasses and implements the Masonry Wall Inspection.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-44	Group 6 elastomer seals, gaskets, and moisture barriers	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	No	Consistent with NUREG-1801. Elastomeric components for Groups 1-3, 5, 6 structures are managed by the Structures Monitoring Program. Seals with a fire barrier intended function are managed by the Fire Protection Program. See Item Number 3.3.1-61. Loss of sealing is not an aging effect, but rather a consequence of elastomer degradation. Loss of sealing may be caused by cracking or change in material properties aging effects for elastomeric material.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	Loss of material due to abrasion or cavitation is not an aging effect requiring management for concrete components exposed to raw water because the Spray Pond water does not contain abrasive material and flow velocity in water control structures is less than the cavitation threshold. The absence of concrete aging effects is confirmed under the Structures Monitoring Program – Water Control Structures Inspection . The Structures Monitoring Program includes the 10 elements evaluation for the NUREG-1801 XI.S7 aging management program. Columbia is not committed to Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. The Structures Monitoring Program encompasses and implements the Water Control Structures Inspection.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801					
Item Number	**Component/Commodity**	**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 channels.	No	Consistent with NUREG-1801. Loss of material is managed by the BWR Water Chemistry Program, monitoring of spent fuel pool water level in accordance with Technical Specifications, and monitoring of leak chase channels. The leak chase channels are designed to permit free gravity drainage to the radioactive drain system, the flow of which is monitored via operator rounds under the CLB as stated in FSAR Section 9.1.2.2.2. Cracking due to SCC is not an aging effect requiring management because SCC occurs through the combination of high stress (both applied and residual tensile stresses), a corrosive environment and temperature, which are not found in the spent fuel pool. The spent fuel pool water temperature is below the 140°F threshold during normal operation.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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. If protective coatings are relied upon to manage aging, protective coating monitoring and maintenance provisions should be included.	No	Metal structural components within Group 6 structures are managed by the Structures Monitoring Program – Water Control Structures Inspection. The Structures Monitoring Program includes the 10 elements evaluation for the NUREG-1801 XI.S7 aging management program. Columbia is not committed to Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. The Structures Monitoring Program encompasses and implements the Water Control Structures Inspection. ASME metal structural components associated with Group 6 structures are managed by the Inservice Inspection (ISI) Program – IWF.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-48	Group 6: earthen water control structures - dams, embankments, reservoirs, channels, canals, and ponds	Loss of material, loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs	No	Not applicable for Columbia. There are no earthen structures associated with the standby Service Water Pump House or the Spray Pond. Under the current licensing bases the Spray Pond includes a 6-inch sedimentation allowance for water inventory considerations. This allowance includes all forms of accumulation, such as dust, silt, or volcanic ash. The spray ponds are cleaned whenever the sedimentation reaches 3 inches, which ensures adequate water supply even in the event of a design basis ashfall.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	Consistent with NUREG-1801. The listed structural components exposed to treated water are managed by the Inservice Inspection (ISI) Program – IWF and the BWR Water Chemistry Program. Non ASME structural components exposed to treated water are managed by the Structures Monitoring 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	Consistent with NUREG-1801. The listed structural components are managed by the Structures Monitoring Program.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	Three parameters are required for stress corrosion cracking (SCC) to occur: (1) a corrosive environment, (2) a susceptible material, and (3) tensile stresses greater than or equal to the yield strength of the material. Corrosive environments containing sodium hydroxide, seawater, nitrate solutions, sulfuric acids, or aggressive groundwater (chlorides > 500 ppm, sulfates > 1,500 ppm) are not present at Columbia. The internal environment of in-scope structures does not contain aggressive chemicals or contaminants under normal operating conditions. Therefore, the environmental conditions necessary for SCC to occur do not exist. Review of plant-specific operating experience identified no occurrences of SCC on high strength structural bolting.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-52	Groups B2, and B4: sliding support bearings 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	Aging degradations of supports designed with or without sliding connections are managed by the Structures Monitoring Program. The inspection criteria for supports within the programs effectively envelope misalignment and accumulation of debris.
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	Consistent with NUREG-1801. The listed structural components are managed by the Inservice Inspection (ISI) Program – IWF.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-54	Groups B1.1, B1.2, and B1.3: Constant and variable load spring hangers; guides; stops;	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	Loss of mechanical function due to the listed mechanisms is not an aging effect identified in the Structural Tools or at Columbia. Proper design prevents distortion, overload, and fatigue due to vibratory and cyclic thermal loads. However, aging degradations on Groups B1.1, B1.2, and B1.3 constant and variable load spring hangers; guides; stops are managed by the Inservice Inspection (ISI) Program – IWF. The inspection criteria for supports within the programs effectively envelope misalignment and accumulation of debris.
3.5.1-55	PWR Only				

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	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	Aging degradations of Groups B1.1, B1.2, and B1.3 supports designed with or without sliding connections are managed by the Inservice Inspection (ISI) Program – IWF. The inspection criteria for supports within the programs effectively envelope misalignment and accumulation of debris.
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	Not applicable for Columbia. There were no Groups B1.1, B1.2, and B1.3 vibration isolation elements identified at Columbia.
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	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.

Table 3.5.2-1 Aging Management Review Results - Primary Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Downcomer Bracing and Supports	SSR	Carbon Steel	Air - indoor	Loss of material	Inservice Inspection Program-IWF	III.B1.2-10	3.5.1-53	A
						Structures Monitoring Program	III.A4-5	3.5.1-25	A
2	Downcomer Bracing and Supports	SSR	Carbon Steel	Treated water	Loss of material	Inservice Inspection Program-IWF BWR Water Chemistry Program	III.B1.1-11	3.5.1-49	C 0509
3	Downcomer Jet Deflectors	HELB, SSR	Carbon Steel	Air - indoor	Loss of material	Structures Monitoring Program	III.A4-5	3.5.1-25	A
4	Drywell Floor Decking	SSR	Galvanized Steel	Air - indoor	None	None	III.B1.1-7	3.5.1-58	C
5	Drywell Floor Peripheral Seal Assembly	DF, EN, EXP, SPB, SSR	Stainless Steel	Air - indoor	None	Inservice Inspection Program-IWE Appendix J Program	N/A	N/A	I 0501, 0502
6	Drywell Floor Peripheral Seal Jet Deflectors	HELB, SSR	Carbon Steel	Air - indoor	Loss of material	Structures Monitoring Program	III.A4-5	3.5.1-25	A
7	Drywell Floor Shear Lugs	SSR	Carbon Steel	Air - indoor	Loss of material	Inservice Inspection Program-IWE Appendix J Program	II.B2.1-1	3.5.1-05	A 0502

Table 3.5.2-1 Aging Management Review Results - Primary Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Drywell Head (including drywell head flanges, lifting lugs, support feet, and double o-rings)	EN, SPB, SSR	Carbon Steel/ Elastomer	Air - indoor	Loss of material	Inservice Inspection Program-IWE Appendix J Program	II.B2.1-1	3.5.1-05	A 0502
9	Drywell Sump Liners	SSR	Stainless Steel	Raw water	Loss of material	Structures Monitoring Program BWR Water Chemistry Program	N/A	N/A	J 0508
10	Equipment Hatch and CRD Removal Hatch (including flange gaskets and closure mechanisms)	EN, SPB, SSR	Carbon Steel/ Elastomer	Air - indoor	Loss of material	Inservice Inspection Program-IWE Appendix J Program Plant Technical Specification	II.B4-5 II.B4-6	3.5.1-17 3.5.1-18	A 0506
11	Penetrations (Mechanical and Electrical, primary containment boundary)	EN, SPB, SSR	Carbon Steel/ Elastomer	Air - indoor	Loss of material	Inservice Inspection Program-IWE Appendix J Program	II.B4-1	3.5.1-18	A 0505
12	Penetrations (Mechanical and Electrical, primary containment boundary)	EN, SPB, SSR	Stainless Steel	Air - indoor	None	Inservice Inspection Program-IWE Appendix J Program	N/A	N/A	I 0501, 0505

Table 3.5.2-1 Aging Management Review Results - Primary Containment									
Row No.	**Component / Commodity**	**Intended Function[1]**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
13	Personnel Access Lock (including gaskets, hatch locks, hinges and closure mechanisms)	EN, SPB, SSR	Carbon Steel/ Elastomer	Air - indoor	Loss of material	Inservice Inspection Program-IWE Appendix J Program Plant Technical Specification	II.B4-5 II.B4-6	3.5.1-17 3.5.1-18	A 0506
14	Pipe Whip Protection Support Rings	EN, PW, SSR	Carbon Steel	Air - indoor	Loss of material	Structures Monitoring Program	III.A4-5	3.5.1-25	A
15	Primary Containment Vessel	EN, SPB, SRE, SSR	Carbon Steel	Air - indoor	Loss of material	Inservice Inspection Program -IWE Appendix J Program	II.B2.1-1	3.5.1-05	A 0502
16	Primary Containment Vessel Inner and Outer Support Skirts	SPB, SSR	Carbon Steel	Concrete	None	None	VII.J-21	3.3.1-96	C
17	Quencher Support	SSR	Carbon Steel	Treated water	Loss of material	Inservice Inspection Program-IWF BWR Water Chemistry Program	III.B1.1-11	3.5.1-49	C 0509
18	Radial Beam Framing System	EN, SSR	Carbon Steel	Air - indoor	Loss of material	Structures Monitoring Program	III.A4-5	3.5.1-25	A
19	Reactor Vessel Thermal Insulation	EN, PR, SSR	Stainless Steel/ Aluminum	Air - indoor	None	None	III.B1.1-9 III.B1.1-6	3.5.1-59 3.5.1-58	C C
20	Refueling Bellows Seals	EXP, FLB, SSR	Stainless Steel	Air - indoor	None	Structures Monitoring Program	III.B1.1-9	3.5.1-59	C 0501 0503

Table 3.5.2-1 Aging Management Review Results - Primary Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
21	Refueling Bulkhead Seal Plate	FLB, SSR	Carbon Steel	Air - indoor	Loss of material	Structures Monitoring Program	III.A4-5	3.5.1-25	A
22	Sacrificial Shield Wall Inner and Outer Skins (including removable plugs, shield doors, and removable panels)	EN, SHD, SNS, SSR	Carbon Steel	Air - indoor	Loss of material	Structures Monitoring Program	III.A4-5	3.5.1-25	A
23	Sand Filled Pocket Area (including closure ring)	DF, FLB, SSR	Carbon Steel	Air - indoor	Loss of material	Inservice Inspection Program-IWE Appendix J Program	II.B2.1-1	3.5.1-05	A 0502 0504
24	Stabilizer Truss	SSR	Carbon Steel	Air - indoor	Loss of material	Inservice Inspection Program-IWF Structures Monitoring Program	III.B.1.3-10 III.A4-5	3.5.1-53 3.5.1-25	A A
25	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SNS, SSR	Carbon Steel	Air - indoor	Loss of material	Structures Monitoring Program	III.A4-5	3.5.1-25	A
26	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SNS, SSR	Galvanized Steel	Air - indoor	None	None	III.B1.1-7	3.5.1-58	C

Table 3.5.2-1 Aging Management Review Results - Primary Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
27	Suppression Chamber (including vertical stiffeners and horizontal stiffener rings)	EN, HS, SPB, SRE, SSR	Carbon Steel	Air - indoor	Loss of material	Inservice Inspection Program-IWE Appendix J Program	II.B2.1-1	3.5.1-05	A 0502
28	Suppression Chamber (including vertical stiffeners and horizontal stiffener rings)	EN, HS, SPB, SRE, SSR	Carbon Steel	Treated water	Loss of material	Inservice Inspection Program-IWE Appendix J Program BWR Water Chemistry Program	II.B2.1-1	3.5.1-05	A 0502 0507
29	Suppression Chamber (bottom ellipsoidal head)	EN, HS, SPB, SRE, SSR	Carbon Steel	Concrete	None	None	VII.J-21	3.3.1-96	C
30	Suppression Chamber Access Hatch (including flange gaskets and closure mechanisms)	EN, SPB, SSR	Carbon Steel/ Elastomer	Air - indoor	Loss of material	Inservice Inspection Program-IWE Appendix J Program Plant Technical Specification	II.B4-5 II.B4-6	3.5.1-17 3.5.1-18	A 0506
31	Concrete Under the Ellipsoidal Head	SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
32	Drywell Floor	EN, FLB, MB, SSR, SRE	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501

Table 3.5.2-1 Aging Management Review Results - Primary Containment									
Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
33	Drywell Floor Support Columns	SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
34	Drywell Floor Support Columns	SSR	Concrete	Treated water	None	Structures Monitoring Program	N/A	N/A	I 0501
35	Drywell Sumps	DF, FLB, SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
36	Floor Trench	DF, SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
37	Reactor Pedestal	SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
38	Reactor Pedestal	SSR	Concrete	Treated water	None	Structures Monitoring Program	N/A	N/A	I 0501
39	Reinforced Concrete Lining Inside the Bottom Head of the Primary Containment Vessel	SSR	Concrete	Treated water	None	Structures Monitoring Program	N/A	N/A	I 0501
40	Sacrificial Shield Wall	EN, MB, SHD, SNS, SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
41	Sand Filled Pocket Area	DF, FLB, SSR	Concrete (w/ Sand)	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501 0504

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-2 Aging Management Review Results - Reactor Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Blowout Panels	SPB, SSR	Carbon Steel	Air - indoor	Loss of material	Structures Monitoring Program	III.A2-12	3.5.1-25	A
2	Blowout Panels	SPB, SSR	Carbon Steel	Air - outdoor	Loss of material	Structures Monitoring Program	III.A2-12	3.5.1-25	A
3	Cranes, including Bridge, Trolley, Rails, and Girders	SNS, SSR	Carbon Steel	Air - indoor	Loss of material	Material Handling System Inspection Program	VII.B-3	3.3.1-73	A
4	Elevated Release Stack	RP, SSR	Carbon Steel	Air - outdoor	Loss of material	Structures Monitoring Program	III.A2-12	3.5.1-25	A
5	Lead Shield Panels	SHD, SNS	Stainless Steel	Air - indoor	None	None	III.B5-5	3.5.1-59	C 0516
6	Metal Siding	EN, SPB, SSR	Galvanized Steel	Air - indoor	None	None	III.B5-3	3.5.1-58	C
7	Metal Siding	EN, SPB, SSR	Galvanized Steel	Air - outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
8	New Fuel Racks	EN, SSR	Aluminum/ Stainless Steel fasteners	Air - indoor	None	None	III.B5-2 III.B5-5	3.5.1-58 3.5.1-59	C 0511 A 0511
9	Reactor Well and Dryer-Separator Storage Pool Gates	SSR	Aluminum	Air - indoor	None	None	III.B5-2	3.5.1-58	C
10	Reactor Well and Dryer-Separator Storage Pool Liners	SSR	Stainless Steel	Air - indoor	None	None	III.B5-5	3.5.1-59	C

Table 3.5.2-2 Aging Management Review Results - Reactor Building									
Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
11	Roof Decking	EN, SPB, SSR	Galvanized Steel	Air - indoor	None	None	III.B5-3	3.5.1-58	C
12	Roof Masts	SRE	Galvanized Steel	Air - outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
13	Secondary Containment Air Locks (includes railroad bay and double air lock doors)	MB, SPB, SSR	Carbon Steel	Air - indoor	Loss of material	Structures Monitoring Program	III.A2-12	3.5.1-25	A
14	Secondary Containment Air Locks (includes railroad bay and double air lock doors)	MB, SPB, SSR	Carbon Steel	Air - outdoor	Loss of material	Structures Monitoring Program	III.A2-12	3.5.1-25	A
15	Spent Fuel Pool Gates	SSR	Aluminum	Air - indoor	None	None	III.B5-2	3.5.1-58	C
16	Spent Fuel Pool Gates	SSR	Aluminum	Treated water	Loss of material	BWR Water Chemistry Program	VII.A4-5	3.3.1-24	C 0513 0514

Table 3.5.2-2 Aging Management Review Results - Reactor Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
17	Spent Fuel Pool Liner	SSR	Stainless Steel	Treated water	Loss of material	BWR Water Chemistry Program Spent Fuel Pool Water Monitoring per Tech Spec Monitoring of leakage from the leak chase channels	III.A5-13	3.5.1-46	A 0512
18	Spent Fuel Storage Racks	SSR	Stainless Steel	Treated water	Loss of material	BWR Water Chemistry Program	VII.A4-11	3.3.1-24	C 0514
19	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SSR	Carbon Steel	Air - indoor	Loss of material	Structures Monitoring Program	III.A2-12	3.5.1-25	A
20	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SSR	Galvanized Steel	Air - indoor	None	None	III.B5-3	3.5.1-58	C
21	Sump Liners	SNS	Stainless Steel	Air - indoor	None	None	III.B5-5	3.5.1-59	C
22	Sump Liners	SNS	Stainless Steel	Raw water	Loss of material	Structures Monitoring Program	VII.C3-7	3.3.1-78	E 0515
23	Biological Shield Wall	EN, MB, SHD, SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501

Table 3.5.2-2 Aging Management Review Results - Reactor Building									
Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
24	Elevated Release Stack	RP, SSR	Concrete	Air - outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
25	Exterior Walls (above grade)	EN, MB, SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
26	Exterior Walls (above grade)	EN, MB, SSR	Concrete	Air - outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
27	Exterior Walls (below grade)	EN, SSR	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
28	Foundations	EN, EXP, SSR	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
29	Main Steam Tunnel	EN, HELB, MB, PW, SHD, SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
30	New Fuel Storage Vault and Cover	EN, SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
31	Pipe Chase	EN, SHD, SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
32	Pump Pits	SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
33	Refueling pools (spent fuel, reactor well, dryer-separator pools)	EN, SHD, SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501

Table 3.5.2-2 Aging Management Review Results - Reactor Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
34	Reinforced Concrete: Walls, floors, and ceilings	EN, FB, FLB, HELB, MB, SHD, SNS, SRE, SSR	Concrete	Air - indoor	None	Structures Monitoring Program Fire Protection Program	N/A	N/A	I 0501
35	Shield Plugs	EN, SHD, SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
36	Shield Walls	SHD, SNS	Concrete (solid blocks or bricks)	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501 0517
37	Sumps	SNS	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
38	Spent Fuel Rack Neutron Absorbers	ABN, SSR	Boron Carbide		None	None	N/A	N/A	J 0510
			Stainless Steel (sheathing)	Treated water	Loss of material	BWR Water Chemistry Program	VII.A4-11	3.3.1-24	C 0510 0514

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-3 Aging Management Review Results – Standby Service Water Pump House 1A and 1B and Spray Pond 1A and 1B

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bulkhead Fixed Screens	SRE, SSR	Stainless Steel	Water-flowing	Loss of material	Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518
2	Bulkhead Fixed Screen Frames	SRE, SSR	Galvanized Steel	Water-flowing	Loss of material	Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518
3	Bulkhead Screen Guides	SRE, SSR	Carbon Steel	Water-flowing	Loss of material	Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518
4	Spray pond circular header supports	SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Inservice Inspection Program-IWF	III.B1.3-10	3.5.1-53	A
						Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518
5	Spray pond circular header supports	SRE, SSR	Carbon Steel	Raw water	Loss of material	Inservice Inspection Program-IWF	III.B1.3-10	3.5.1-53	A
						Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518

Table 3.5.2-3 Aging Management Review Results – Standby Service Water Pump House 1A and 1B and Spray Pond 1A and 1B

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
6	Spray pond circular header supports	SRE, SSR	Teflon (Fluorogold®)	Air-outdoor	Cracking	Inservice Inspection Program-IWF Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	J 0518
7	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518
8	Barrier Skimmer Wall	SRE, SSR	Concrete	Water-flowing	Loss of material Cracking	Structures Monitoring Program – Water Control Structures Inspection	III.A6-5	3.5.1-35	E 0518 0519
9	Foundations	EN, SRE, SSR	Concrete	Soil	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501, 0518
10	Pump Intake Chambers	SCW, SRE, SSR	Concrete	Water-flowing	Loss of material Cracking	Structures Monitoring Program – Water Control Structures Inspection	III.A6-5	3.5.1-35	E 0518 0519
11	Reinforced Concrete: Walls, floors, and ceilings	EN, MB, SNS, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518

Table 3.5.2-3 Aging Management Review Results – Standby Service Water Pump House 1A and 1B and Spray Pond 1A and 1B

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
12	Roof Slabs	EN, MB, SNS, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518
13	Spray Pond Depressed Sump	EN, HS, SCW, SRE, SSR	Concrete	Raw water	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518 0520
14	Spray Pond Foundation	EN, HS, SCW, SRE, SSR	Concrete	Raw water	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518 0520
15	Spray Pond Foundation	EN, HS, SCW, SRE, SSR	Concrete	Soil	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518
16	Spray Pond Sand Trap	EN, HS, SCW, SRE, SSR	Concrete	Raw water	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518 0520
17	Spray Pond Walls (below grade)	EN, HS, SCW, SRE, SSR	Concrete	Soil	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518
18	Spray Pond Walls (above grade)	EN, HS, SCW, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518

Table 3.5.2-3 Aging Management Review Results – Standby Service Water Pump House 1A and 1B and Spray Pond 1A and 1B

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Spray Pond Walls	EN, HS, SCW, SRE, SSR	Concrete	Water-flowing	Loss of material Cracking	Structures Monitoring Program – Water Control Structures Inspection	III.A6-5	3.5.1-35	E 0518 0519
20	Standby Service Water Pump House Exterior Walls (above grade)	EN, MB, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518
21	Standby Service Water Pump House Exterior Walls (below grade)	EN, SRE, SSR	Concrete	Soil	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518
22	Sumps	SNS	Concrete	Air-indoor	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518
23	Sumps	SNS	Concrete	Raw water	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-4 Aging Management Review Results - Circulating Water Pump House

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Battery Racks	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518
2	Bulkhead Screen Frames	SRE	Galvanized Steel	Water-flowing	Loss of material	Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518
3	Bulkhead Screens	SRE	Stainless Steel	Water-flowing	Loss of material	Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518
4	Bulkhead Screen Guides	SRE	Carbon Steel	Water-flowing	Loss of material	Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518
5	Metal Siding	SRE	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518
6	Roof Decking	SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
7	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518

Table 3.5.2-4 Aging Management Review Results - Circulating Water Pump House

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
9	Foundation	SRE	Concrete	Water-flowing	Loss of material Cracking	Structures Monitoring Program – Water Control Structures Inspection	III.A6-5	3.5.1-35	E 0518 0519
10	Foundation	SRE	Concrete	Soil	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518
11	Reinforced Concrete: Walls, floors, and ceilings	SRE	Concrete	Air-indoor	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518
12	Masonry Block Walls	FB, SRE	Concrete Blocks	Air-indoor	Cracking	Structures Monitoring Program – Masonry Wall Inspection Fire Protection Program	III.A6-10 III.A6-10	3.5.1-43 3.5.1-43	A E

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-5 Aging Management Review Results – Diesel Generator Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Battery Racks	SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B3-7	3.5.1-39	C
2	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.A3-12	3.5.1-25	A
3	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SSR	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
4	Diesel Generator Exhaust Plenums	EN, MB, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
5	Diesel Generator Intake Plenums	EN, MB, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
6	Diesel Generator Pedestals	EXP, EN, SSR	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
7	Exterior Walls (above grade)	EN, MB, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
8	Foundations	EN, EXP, SRE, SSR	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
9	Reinforced Concrete: Walls, floors, and ceilings	EN, FB, MB, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring Program Fire Protection Program	N/A	N/A	I 0501

Table 3.5.2-5 Aging Management Review Results – Diesel Generator Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Roof	EN, MB, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501 0526

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-6 Aging Management Review Results – Fresh Air Intake Structure No. 1 and 2

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Concrete Air Plenum	EN, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
2	Exterior Walls (above grade)	EN, MB, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
3	Exterior Walls (below grade)	EN, SSR	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
4	Foundations	EN, SSR	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
5	Roof	EN, MB, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-7 Aging Management Review Results – Makeup Water Pump House

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518
2	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SNS	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
3	Exterior Walls (above grade)	MB, SNS	Concrete	Air-outdoor	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518
4	Pump Pit	SNS	Concrete	Air-indoor	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518
5	Foundations	SNS	Concrete	Soil	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518
6	Reinforced Concrete: Walls, floors, and ceilings	SNS	Concrete	Air-indoor	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518
7	Roof	MB, SNS	Concrete	Air-indoor	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501 0518 0526

Table 3.5.2-7 Aging Management Review Results – Makeup Water Pump House

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-8 Aging Management Review Results – Radwaste Control Building									
Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Battery Racks	SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B3-7	3.5.1-39	C
2	Control Room Ceiling	SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.A1-12	3.5.1-25	A
3	Metal Siding	SNS	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
4	Partition Walls	SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
5	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SSR, SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.A1-12	3.5.1-25	A
6	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SSR, SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
7	Sump Liners	SNS	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
8	Exterior Walls (above grade)	EN, MB, SHD, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
9	Foundations	EN, EXP, SRE, SSR	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501

Table 3.5.2-8 Aging Management Review Results – Radwaste Control Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Masonry Block Walls	FB, SHD, SRE	Concrete Blocks	Air-indoor	Cracking	Structures Monitoring Program – Masonry Wall Inspection Fire Protection Program	III.A3-11 III.A3-11	3.5.1-43 3.5.1-43	A E
11	Reinforced Concrete: Walls, floors, and ceilings	EN, FB, SHD, SPB, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring Program Fire Protection Program	N/A	N/A	I 0501
12	Reinforced Concrete: Walls, floors, and ceilings (Radwaste Control Building Zone E at el. 437'-0" and Zone K at el. 467' 0")	EN, FB, SHD, SPB, SRE, SSR	Concrete	Air-indoor	Cracking Change in material properties	Structures Monitoring Program Fire Protection Program	N/A	N/A	H 0521
13	Roof	EN, MB, SSR	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501 0526
14	Sumps	SNS	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-9 Aging Management Review Results – Service Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Roof Decking	SNS	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
2	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.A3-12	3.5.1-25	A
3	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SNS	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
4	Exterior Walls (above grade)	EN, SNS	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
5	Foundations	EN, EXP, SNS	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
6	Reinforced Concrete: Walls, floors, and ceilings	EN, SNS	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-10 Aging Management Review Results – Turbine Generator Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Metal Siding	SRE, SNS	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
2	Roof Decking	SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
3	Shield Walls	MB	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B3-7	3.5.1-39	C 0517
4	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SNS, SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.A3-12	3.5.1-25	A
5	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SNS, SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
6	Sump Liners	SNS	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
7	Sump Liners	SNS	Stainless Steel	Raw water	Loss of material	Structures Monitoring Program	VII.C3-7	3.3.1-78	E 0515
8	Exterior Walls (above grade)	EN, SNS, SRE	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
9	Foundations	EN, EXP, SNS, SRE	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
10	Main Steam Tunnel Extension	EN, HELB, MB, PW, SHD, SSR	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501

Table 3.5.2-10 Aging Management Review Results – Turbine Generator Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
11	Masonry Block Walls	EN, FB, SRE	Concrete Blocks	Air-indoor	Cracking	Structures Monitoring Program – Masonry Wall Inspection Fire Protection Program	III.A3-11 III.A3-11	3.5.1-43 3.5.1-43	A E
12	Reinforced Concrete: Walls, floors, and ceilings	EN, FB, SNS, SRE	Concrete	Air-indoor	None	Structures Monitoring Program Fire Protection Program	N/A	N/A	I 0501
13	Shield Walls	EN, MB, SHD	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
14	Shield Walls	EN, MB, SHD	Concrete (solid blocks or bricks)	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501 0517
15	Sumps	SNS	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
16	Turbine Generator Pedestals	EN, SRE, SNS	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-11 Aging Management Review Results – Water Filtration Building									
Row No.	**Component / Commodity**	**Intended Function[1]**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Battery Racks	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B3-7	3.5.1-39	C
2	Metal Siding	SRE	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
3	Roof Decking	SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
4	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.A3-12	3.5.1-25	A
5	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
6	Foundations	SRE	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
7	Sumps	SRE	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component/Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Ashe Relay House Metal Siding	SRE	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.A3-12	3.5.1-25	A
2	Ashe Relay House Roof Decking	SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
3	Ashe Relay House Roof Decking	SRE	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
4	Ashe Relay House Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.A3-12	3.5.1-25	A
5	Fire Water Bladder Tank (FP-TK-110) Vent Line Enclosure	SRE	Aluminum	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0522
6	Manhole Covers	EN, SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.A3-12	3.5.1-25	A
7	Transmission Towers	SRE	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
8	Weir Box	SRE	Carbon Steel	Water-flowing	Loss of material	Structures Monitoring Program – Water Control Structures Inspection	III.A6-11	3.5.1-47	E 0518
9	Ashe Relay House Foundation	SRE	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component/Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Circulating Water Basin	SNS, SRE	Concrete	Soil	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501
11	Circulating Water Basin	SNS, SRE	Concrete	Air-outdoor	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501
12	Circulating Water Basin	SNS, SRE	Concrete	Raw water	Loss of material Cracking	Structures Monitoring Program – Water Control Structures Inspection	III.A6-5	3.5.1-35	E 0518 0519 0520
13	Condensate Storage Tank Foundation (ring wall)	SNS, SRE	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
14	Condensate Storage Tank Retaining Area (slab)	FLB, SRE, SSR	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
15	Condensate Storage Tank Retaining Area (slab)	FLB, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
16	Condensate Storage Tank Retaining Area (walls)	FLB, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
17	Cooling Tower Basins	SNS	Concrete	Soil	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501
18	Cooling Tower Basins	SNS	Concrete	Air-outdoor	None	Structures Monitoring Program – Water Control Structures Inspection	N/A	N/A	I 0501

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component/Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Cooling Tower Basins	SNS	Concrete	Raw water	Loss of material Cracking	Structures Monitoring Program – Water Control Structures Inspection	III.A6-5	3.5.1-35	E 0518 0519 0520
20	Duct banks	EN, SNS, SRE, SSR	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
21	Fire Water Bladder Tank (FP-TK-110) Embankment Apron	SRE	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
22	Fire Water Bladder Tank (FP-TK-110) Support Pads	SRE	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
23	HSSF Liquid Hydrogen Storage Tank Foundation (slab)	SNS	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
24	HSSF Liquid Hydrogen Storage Tank Foundation (raised pedestals)	SNS	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
25	Manholes	EN, SNS, SRE, SSR	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
26	Manholes	EN, SNS, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
27	Thrust Blocks	SRE	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
28	Transformer/ Breaker Foundations (SBO)	SRE	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component/Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
29	Transformer/ Breaker Foundations (SBO)	SRE	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
30	Transmission Tower Foundations	SRE	Concrete	Soil	None	Structures Monitoring Program	N/A	N/A	I 0501
31	Transmission Tower Foundations	SRE	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
32	Fire Water Bladder Tank (FP-TK-110) Embankment	SRE	Earthen	Air-outdoor	Loss of form	Structures Monitoring Program	N/A	N/A	G

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Steel and Other Metals									
1	Anchorage/Embedments	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
2	Anchorage/Embedments	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5 III.B3-3 III.B4-5 III.B5-3	3.5.1-58	A
3	Anchorage/Embedments	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5	3.5.1-59	A
4	Anchorage/Embedments	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
5	Anchorage/Embedments	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7 III.B4-7	3.5.1-50	A
6	Anchorage/Embedments	SNS, SRE, SSR	Stainless Steel	Air-outdoor	None	Structures Monitoring Program	III.B2-7 III.B4-7	3.5.1-50	I 0525
7	Anchorage/Embedments	SNS, SRE, SSR	Carbon Steel	Raw water	Loss of material	Structures Monitoring Program	III.A6-11	3.5.1-47	E

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Anchorage/Embedments	SNS, SRE, SSR	Galvanized Steel	Raw water	Loss of material	Structures Monitoring Program	III.A6-11	3.5.1-47	E
9	Anchorage/Embedments	SNS, SRE, SSR	Stainless Steel	Raw water	Loss of material	Structures Monitoring Program	VII.C3-7	3.3.1-78	E 0524
10	Cable Tie Wraps	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5	3.5.1-59	C
11	Cable Tray and Conduit Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	A
12	Cable Tray and Conduit Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5	3.5.1-58	A
13	Cable Tray and Conduit Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	A
14	Cable Tray and Conduit Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	A
15	Cable Trays and Conduits	EN, FB, SNS, SRE, SSR	Aluminum	Air-indoor	None	None	III.B3-2	3.5.1-58	C
16	Cable Trays and Conduits	EN, FB, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	C
17	Cable Trays and Conduits	EN, FB, SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5	3.5.1-58	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
18	Cable Trays and Conduits	EN, FB, SNS, SRE, SSR	Aluminum	Air-outdoor	None	Structures Monitoring Program	III.B2-7	3.5.1-50	I 0525
19	Cable Trays and Conduits	EN, FB, SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	C
20	Cable Trays and Conduits	EN, FB, SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
21	Component and Piping Supports (ASME Class 1, 2, 3 and MC)	SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Inservice Inspection Program-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10	3.5.1-53	A
22	Component and Piping Supports (ASME Class 1, 2, 3 and MC)	SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B1.1-7 III.B1.2-5 III.B1.3-5	3.5.1-58	A
23	Component and Piping Supports (ASME Class 1, 2, 3 and MC)	SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B1.1-9 III.B1.2-7 III.B1.3-7	3.5.1-59	A
24	Component and Piping Supports (ASME Class 1, 2, 3 and MC)	SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Inservice Inspection Program-IWF	III.B1.2-10	3.5.1-53	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
25	Component and Piping Supports (ASME Class 1, 2, 3 and MC)	SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Inservice Inspection Program-IWF	III.B1.2-10	3.5.1-53	A
26	Component and Piping Supports (ASME Class 1, 2, 3 and MC)	SRE, SSR	Carbon Steel	Raw water	Loss of material	Inservice Inspection Program-IWF	III.A6-11	3.5.1-47	E
27	Component and Piping Supports (ASME Class 1, 2, 3 and MC)	SRE, SSR	Galvanized Steel	Raw water	Loss of material	Inservice Inspection Program-IWF	III.A6-11	3.5.1-47	E
28	Component and Piping Supports (ASME Class 1, 2, 3 and MC)	SRE, SSR	Carbon Steel	Treated water	Loss of material	Inservice Inspection Program-IWF BWR Water Chemistry Program	III.B1.1-11	3.5.1-49	A
29	Component and Piping Supports (ASME Class 1, 2, 3 and MC)	SRE, SSR	Galvanized Steel	Treated water	Loss of material	Inservice Inspection Program-IWF BWR Water Chemistry Program	III.B1.1-11	3.5.1-49	A
30	Component and Piping Supports (ASME Class 1, 2, 3 and MC)	SRE, SSR	Stainless Steel	Treated water	Loss of material	Inservice Inspection Program-IWF BWR Water Chemistry Program	III.B1.1-11	3.5.1-49	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
31	Damper Framing (in-wall)	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	A
32	Damper Framing (in-wall)	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5	3.5.1-58	C
33	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B3-7	3.5.1-39	C
34	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B3-3	3.5.1-58	C
35	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	C
36	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
37	Electrical Bus Ducts	EN, SRE, SSR	Aluminum	Air-indoor	None	None	III.B3-2	3.5.1-58	C
38	Electrical Bus Ducts	EN, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	VI.A-13	3.6.1-09	A
39	Electrical Bus Ducts	EN, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B3-3	3.5.1-58	C
40	Electrical Bus Ducts	EN, SRE, SSR	Aluminum	Air-outdoor	None	Structures Monitoring Program	III.B2-7	3.5.1-50	I 0525
41	Electrical Bus Ducts	EN, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	VI.A-13	3.6.1-09	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
42	Electrical Bus Ducts	EN, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	VI.A-13	3.6.1-09	A
43	Equipment Component Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
44	Equipment Component Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5 III.B3-3 III.B4-5 III.B5-3	3.5.1-58	A
45	Equipment Component Supports	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5	3.5.1-59	A
46	Equipment Component Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
47	Equipment Component Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7 III.B4-7	3.5.1-50	A
48	Equipment Component Supports	SNS, SRE, SSR	Stainless Steel	Air-outdoor	None	Structures Monitoring Program	III.B2-7 III.B4-7	3.5.1-50	I 0525

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
49	Flood Curbs	FLB, SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	C
50	Flood, Pressure, and Specialty Doors	FLB, MB, PB, SHD, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B4-10	3.5.1-39	C
51	Flood, Pressure, and Specialty Doors	FLB, MB, PB, SHD, SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B4-5	3.5.1-58	C
52	Flood, Pressure, and Specialty Doors	FLB, MB, PB, SHD, SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B4-10	3.5.1-39	C
53	Flood, Pressure, and Specialty Doors	FLB, MB, PB, SHD, SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B4-7	3.5.1-50	C
54	Hatches	EN, FB, FLB, MB, PB, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B4-10	3.5.1-39	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
55	Hatches	EN, FB, FLB, MB, PB, SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B4-5	3.5.1-58	C
56	Hatches	EN, FB, FLB, MB, PB, SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B4-10	3.5.1-39	C
57	Hatches	EN, FB, FLB, MB, PB, SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B4-7	3.5.1-50	C
58	HELB Barriers (includes pipe restraints, whip restraints, and jet/missile impingement shields/plate barriers)	HELB, PW, SNS, SSR	Aluminum	Air-indoor	None	None	III.B5-2	3.5.1-58	C
59	HELB Barriers (includes pipe restraints, whip restraints, and jet/missile impingement shields/plate barriers)	HELB, PW, SNS, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B5-7	3.5.1-39	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
60	HELB Barriers (includes pipe restraints, whip restraints, and jet/missile impingement shields/plate barriers)	HELB, PW, SNS, SSR	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
61	HELB Barriers (includes pipe restraints, whip restraints, and jet/missile impingement shields/plate barriers)	HELB, PW, SNS, SSR	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
62	HELB Barriers (includes pipe restraints, whip restraints, and jet/missile impingement shields/plate barriers)	HELB, PW, SNS, SSR	Stainless Steel	Treated water	Loss of material	Structures Monitoring Program BWR Water Chemistry Program	III.B1.1-11	3.5.1-49	E 0534
63	HVAC Duct Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	A
64	HVAC Duct Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5	3.5.1-58	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
65	HVAC Duct Supports	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8	3.5.1-59	A
66	Instrument Line Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	A
67	Instrument Line Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5	3.5.1-58	A
68	Instrument Line Supports	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8	3.5.1-59	A
69	Instrument Line Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	A
70	Instrument Line Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	A
71	Instrument Line Supports	SNS, SRE, SSR	Stainless Steel	Air-outdoor	None	Structures Monitoring Program	III.B2-7	3.5.1-50	I 0525
72	Instrument Racks and Frames	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B3-7	3.5.1-39	C
73	Instrument Racks and Frames	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B3-3	3.5.1-58	C
74	Instrument Racks and Frames	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B3-7	3.5.1-39	C
75	Instrument Racks and Frames	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
76	Monorails, Hoists and Miscellaneous Cranes	SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B5-7	3.5.1-39	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
77	Penetrations (Mechanical and Electrical, non primary containment boundary)	EN, FB, FLB, PB, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	C
78	Pipe Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10 III.B4-10	3.5.1-39	A
79	Pipe Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5 III.B4-5	3.5.1-58	A
80	Pipe Supports	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8 III.B4-8	3.5.1-59	A
81	Pipe Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-10 III.B4-10	3.5.1-39	A
82	Pipe Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7 III.B4-7	3.5.1-50	A
83	Pipe Supports	SNS, SRE, SSR	Stainless Steel	Air-outdoor	None	Structures Monitoring Program	III.B2-7 III.B4-7	3.5.1-50	I 0525
84	Pipe Supports	SNS, SRE, SSR	Carbon Steel	Raw water	Loss of material	Structures Monitoring Program	III.A6-11	3.5.1-47	E
85	Pipe Supports	SNS, SRE, SSR	Galvanized Steel	Raw water	Loss of material	Structures Monitoring Program	III.A6-11	3.5.1-47	E
86	Pipe Supports	SNS, SRE, SSR	Stainless Steel	Raw water	Loss of material	Structures Monitoring Program	VII.C3-7	3.3.1-78	E 0524

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities									
Row No.	**Component / Commodity**	**Intended Function[1]**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
87	Pipe Supports	SNS, SRE, SSR	Carbon Steel	Treated water	Loss of material	Structures Monitoring Program BWR Water Chemistry Program	III.B1.1-11	3.5.1-49	E
88	Pipe Supports	SNS, SRE, SSR	Stainless Steel	Treated water	Loss of material	Structures Monitoring Program BWR Water Chemistry Program	III.B1.1-11	3.5.1-49	E
89	Stair, Ladder, Platform, and Grating Supports	SNS, SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B5-7	3.5.1-39	A
90	Stair, Ladder, Platform, and Grating Supports	SNS, SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	A
91	Stair, Ladder, Platform, and Grating Supports	SNS, SRE	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B5-7	3.5.1-39	A
92	Stair, Ladder, Platform, and Grating Supports	SNS, SRE	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	A
93	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Aluminum	Air-indoor	None	None	III.B5-2	3.5.1-58	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities									
Row No.	**Component / Commodity**	**Intended Function[1]**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
94	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B5-7	3.5.1-39	C
95	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
96	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Aluminum	Air-outdoor	None	Structures Monitoring Program	III.B4-7	3.5.1-50	I 0525
97	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B5-7	3.5.1-39	C
98	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
99	Tube Track Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	A
100	Tube Track Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5	3.5.1-58	A
101	Tube Track Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	A
102	Tube Track Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	A
103	Tube Tracks	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
104	Tube Tracks	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	C
105	Vents and Louvers	SNS, SRE, SSR	Aluminum	Air-indoor	None	None	III.B2-4	3.5.1-58	C
106	Vents and Louvers	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	C
107	Vents and Louvers	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5	3.5.1-58	C
108	Vents and Louvers	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8	3.5.1-59	C
109	Vents and Louvers	SNS, SRE, SSR	Aluminum	Air-outdoor	None	Structures Monitoring Program	III.B2-7	3.5.1-50	I 0525
110	Vents and Louvers	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-10	3.5.1-39	C
111	Vents and Louvers	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
112	Vents and Louvers	SNS, SRE, SSR	Stainless Steel	Air-outdoor	None	Structures Monitoring Program	III.B2-7	3.5.1-50	I 0525
Threaded Fasteners									
113	Anchor Bolts	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
114	Anchor Bolts	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5 III.B3-3 III.B4-5 III.B5-3	3.5.1-58	A
115	Anchor Bolts	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5	3.5.1-59	A
116	Anchor Bolts	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
117	Anchor Bolts	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7 III.B4-7	3.5.1-50	A
118	Anchor Bolts	SNS, SRE, SSR	Stainless Steel	Air-outdoor	None	Structures Monitoring Program	III.B2-7 III.B4-7	3.5.1-50	I 0525
119	Anchor Bolts	SNS, SRE, SSR	Carbon Steel	Raw water	Loss of material	Structures Monitoring Program	III.A6-11	3.5.1-47	E
120	Anchor Bolts	SNS, SRE, SSR	Galvanized Steel	Raw water	Loss of material	Structures Monitoring Program	III.A6-11	3.5.1-47	E
121	Anchor Bolts	SNS, SRE, SSR	Stainless Steel	Raw water	Loss of material	Structures Monitoring Program	VII.C3-7	3.3.1-78	E 0524

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
122	Anchor Bolts (ASME Class 1, 2, 3 and MC Supports Bolting)	SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Inservice Inspection Program-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10	3.5.1-53	A
123	Anchor Bolts (ASME Class 1, 2, 3 and MC Supports Bolting)	SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B1.1-7 III.B1.2-5 III.B1.3-5	3.5.1-58	A
124	Anchor Bolts (ASME Class 1, 2, 3 and MC Supports Bolting)	SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B1.1-9 III.B1.2-7 III.B1.3-7	3.5.1-59	A
125	Anchor Bolts (ASME Class 1, 2, 3 and MC Supports Bolting)	SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Inservice Inspection Program-IWF	III.B1.2-10	3.5.1-53	A
126	Anchor Bolts (ASME Class 1, 2, 3 and MC Supports Bolting)	SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Inservice Inspection Program-IWF	III.B1.2-10	3.5.1-53	E
127	Anchor Bolts (ASME Class 1, 2, 3 and MC Supports Bolting)	SRE, SSR	Carbon Steel	Raw water	Loss of material	Inservice Inspection Program-IWF	III.A6-11	3.5.1-47	E
128	Anchor Bolts (ASME Class 1, 2, 3 and MC Supports Bolting)	SRE, SSR	Galvanized Steel	Raw water	Loss of material	Inservice Inspection Program-IWF	III.A6-11	3.5.1-47	E

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities									
Row No.	**Component / Commodity**	**Intended Function[1]**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
129	Anchor Bolts (ASME Class 1, 2, 3 and MC Supports Bolting)	SRE, SSR	Carbon Steel	Treated water	Loss of material	Inservice Inspection Program-IWF BWR Water Chemistry Program	III.B1.1-11	3.5.1-49	A
130	Anchor Bolts (ASME Class 1, 2, 3 and MC Supports Bolting)	SRE, SSR	Stainless Steel	Treated water	Loss of material	Inservice Inspection Program-IWF BWR Water Chemistry Program	III.B1.1-11	3.5.1-49	A
131	Expansion Anchors	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Program	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
132	Expansion Anchors	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5 III.B3-3 III.B4-5 III.B5-3	3.5.1-58	A
133	Expansion Anchors	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5	3.5.1-59	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities									
Row No.	**Component / Commodity**	**Intended Function[1]**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
134	Expansion Anchors	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
135	Expansion Anchors	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring Program	III.B2-7 III.B4-7	3.5.1-50	A
136	Expansion Anchors	SNS, SRE, SSR	Stainless Steel	Air-outdoor	None	Structures Monitoring Program	III.B2-7 III.B4-7	3.5.1-50	I 0525
137	Expansion Anchors	SNS, SRE, SSR	Carbon Steel	Raw water	Loss of material	Structures Monitoring Program	III.A6-11	3.5.1-47	E
138	Expansion Anchors	SNS, SRE, SSR	Galvanized Steel	Raw water	Loss of material	Structures Monitoring Program	III.A6-11	3.5.1-47	E
139	Expansion Anchors	SNS, SRE, SSR	Stainless Steel	Raw water	Loss of material	Structures Monitoring Program	VII.C3-7	3.3.1-78	E 0524
Concrete									
140	Equipment Pads	SNS, SRE, SSR	Concrete	Air-indoor	Cracking Change in material properties	Structures Monitoring Program	N/A	N/A	H 0521
141	Equipment Pads	SNS, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
142	Flood Curbs	FLB, SNS	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
143	Floor Trenches	SNS, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
144	Hatches	EN, FB, FLB, MB, PB, SHD, SNS, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
145	Hatches	EN, FB, FLB, MB, PB, SHD, SNS, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
146	Support Pedestals	SNS, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring Program	N/A	N/A	I 0501
147	Support Pedestals	SNS, SRE, SSR	Concrete	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	I 0501
148	Support Pedestals	SNS, SRE, SSR	Concrete	Raw water	Loss of material Cracking	Structures Monitoring Program	III.A6-5	3.5.1-35	E 0519
Elastomeric Components									
149	Biological Shield Wall Annulus Compressible Material	EXP, SSR	Elastomer	Air-indoor	Cracking Change in material properties	Structures Monitoring Program	III.A6-12	3.5.1-44	C 0527 0528

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
150	Building Pressure Boundary Seals and Sealants	EXP, PB, SNS, SSR	Elastomer	Air-indoor	Cracking Change in material properties	Structures Monitoring Program	III.A6-12	3.5.1-44	C 0527 0528
151	Compressible Joints and Seals	EXP, FLB, SNS, SSR	Elastomer	Air-indoor	Cracking Change in material properties	Structures Monitoring Program	III.A6-12	3.5.1-44	C 0527 0528
152	Compressible Joints and Seals	EXP, FLB, SNS, SSR	Elastomer	Air-outdoor	Cracking Change in material properties	Structures Monitoring Program	III.A6-12	3.5.1-44	C 0527 0529
153	Expansion Boots	EXP, FLB, SNS, SRE, SSR	Elastomer	Air-outdoor	Cracking Change in material properties	Structures Monitoring Program	III.A6-12	3.5.1-44	C 0527 0529
154	Expansion Boots	EXP, FLB, SNS, SRE, SSR	Elastomer	Soil	None	None	N/A	N/A	J

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities									
Row No.	**Component / Commodity**	**Intended Function[1]**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
155	Roof Membrane	EN, FLB, SNS, SRE, SSR	Elastomer/ Built-up Roofing	Air-outdoor	Cracking Change in material properties	Structures Monitoring Program	III.A6-12	3.5.1-44	C 0527 0529
156	Waterproofing Membrane	FLB, SNS, SSR	Elastomer	Soil	None	None	N/A	N/A	J
157	Waterstops	FLB, SNS, SSR	Elastomer	Air-indoor (within walls, floors, or foundations)	None	None	N/A	N/A	J
158	Waterstops	FLB, SNS, SSR	Elastomer	Soil	None	None	N/A	N/A	J
Fire Barriers									
159	Fire Doors	FB, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Fire Protection Program	VII.G-3	3.3.1-63	B 0530
						Structures Monitoring Program	III.B4-10	3.5.1-39	C
160	Fire Doors	FB, SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	Fire Protection Program	N/A	N/A	I 0501
						Structures Monitoring Program	III.B4-5	3.5.1-58	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
161	Fire Doors	FB, SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Fire Protection Program Structures Monitoring Program	VII.G-4 III.B4-10	3.3.1-63 3.5.1-39	B 0530 C
162	Fire Doors	FB, SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Fire Protection Program Structures Monitoring Program	VII.G-4 III.B4-7	3.3.1-63 3.5.1-50	B 0530 C
163	Fire Stops	FB, FLB, PB, SNS, SRE, SSR	Silicone Elastomer	Air-indoor	Cracking/ Delamination/ Separation Change in material properties	Fire Protection Program	VII.G-1	3.3.1-61	B 0528
164	Fireproofing	FB, SNS, SRE, SSR	Thermolag	Air-indoor	None	Fire Protection Program	N/A	N/A	J 0501
165	Fire Wraps	SNS, SRE, SSR	Ceramic fiber	Air-indoor	None	Fire Protection Program	N/A	N/A	J 0501 0534
166	Fire Wraps	FB, SNS, SRE, SSR	Darmatt	Air-indoor	None	Fire Protection Program	N/A	N/A	J 0501

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
167	Fire Wraps	FB, SNS, SRE, SSR	Thermolag	Air-indoor	None	Fire Protection Program	N/A	N/A	J 0501
168	Fire Wraps	FB, SNS, SRE, SSR	3M Interam	Air-indoor	None	Fire Protection Program	N/A	N/A	J 0501
Fluoropolymers and Lubrite Sliding Surfaces									
169	Cable Tie Wraps	SNS, SRE, SSR	Fluoropolymer	Air-indoor	None	None	N/A	N/A	J 0531
170	Cable Tie Wraps	SNS, SRE	Nylon	Air-indoor	None	None	N/A	N/A	J 0532
171	Lubrite sliding supports	SNS, SSR	Lubrite	Air-indoor	None	Inservice Inspection Program-IWF Structures Monitoring Program	III.B1.1-5 III.B1.2-3 III.B1.3-3 III.B2-2	3.5.1-56 3.5.1-52.	I 0523 I 0523
Miscellaneous Materials									
172	Containment Penetration Insulation	SNS	Fiberglass	Air-indoor	None	None	N/A	N/A	J
173	Piping and Mechanical equipment Insulation	SNS	Aluminum jacketing	Air-indoor	None	None	N/A	N/A	J

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities									
Row No.	**Component / Commodity**	**Intended Function[1]**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
174	Piping and Mechanical equipment Insulation	SNS	Calcium Silicate	Air-indoor	None	None	N/A	N/A	J
175	Piping and Mechanical equipment Insulation	SNS	Fiberglass	Air-indoor	None	None	N/A	N/A	J
176	Piping and Mechanical equipment Insulation	SNS	Stainless Steel Mirror insulation	Air-indoor	None	None	N/A	N/A	J
177	Piping and Mechanical equipment Insulation	SNS	Aluminum jacketing	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	J 0525
178	Piping and Mechanical equipment Insulation	SNS	Calcium Silicate	Air-outdoor	None	None	N/A	N/A	J
179	Piping and Mechanical equipment Insulation	SNS	Fiberglass	Air-outdoor	None	None	N/A	N/A	J
180	Piping and Mechanical equipment Insulation	SNS	Stainless Steel Mirror insulation	Air-outdoor	None	Structures Monitoring Program	N/A	N/A	J 0525

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes

1 - Refer to Table 2.0-1 for intended function descriptions.

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 takes some 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 takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes:	
0501	No applicable aging effects have been identified for the component type. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.
0502	NUREG-1801 item II.B2.1-1 indicates the moisture barrier, at the junction where the shell or liner becomes embedded, is subject to aging management activities in accordance with ASME Section XI, Subsection IWE requirements. Columbia drywell floor peripheral seal is made of stainless steel and is welded to the primary containment vessel and to the underside of the circular closure girder embedded in the drywell floor. There are no concrete to metal moisture barriers; therefore, the NUREG-1801 text regarding moisture barrier is not applicable.
0503	The refueling stainless steel bellows perform their functions during refueling preventing water from entering the drywell. The bellows are not subjected to cyclic loading during refueling. The normal environment experienced by the refueling bellows is warm, dry air, with short periods of demineralized water contact during refueling.
0504	Due to possibility of containment shell degradation from corrosion induced by a moist environment in sand pocket region, Columbia has committed to monitor humidity levels in this region. Columbia has implemented a procedure to survey the relative humidity of air drawn from within containment annulus sand pocket region.
0505	The process line penetrations are of welded steel construction without expansion bellows, gaskets, or sealing compounds. Electrical penetration assembly internal o-rings are sub-component of the electrical penetration and are included in this commodity group. Insulation for hot penetrations is addressed in bulk commodities.
0506	Elastomeric seals, gaskets, or o-rings are sub-part of the host component and their leak tightness is monitored by the Appendix J Program. Plant Technical Specification ensures that access airlocks and hatches maintain leak tightness in the closed position.
0507	In addition to Inservice Inspection Program-IWE and Appendix J Program as AMP, the BWR Water Chemistry Program is credited with the elimination of excessive chlorides and sulfates from the water.
0508	In addition to Structures Monitoring Program as AMP, the BWR Water Chemistry Program is credited with the elimination of excessive chlorides and sulfates from the water.
0509	Note C is used since NUREG-1801 only has an ASME Class 1 item for component in treated water. Component is ASME Class 2; the NUREG-1801 item is the closest match.

Plant-Specific Notes:	
0510	Aging management for loss of material of the neutron absorber stainless steel sheathing is required by the listed AMP. Columbia plant-specific AMR concluded boron carbide plates (B4C) do not require aging management for the period of extended operation for their neutron absorbing function based on plant-specific examination and industry operating experience. However; Columbia has already committed in the CLB to perform boron carbide coupon sample testing and this current commitment will continue to verify the specific design values of the B4C neutron absorbing parameters and demonstrate that the effects of aging are not significant. FSAR Section 9.1.2.3.2 states the CLB commitment, “To ensure the integrity of the spent fuel storage racks in the event that water has leaked into the racks, specially designed control samples, consisting of B4C plates in vented (to pool water) canisters, are placed in a readily accessible position in the spent fuel pool. These samples are subjected to periodic examinations to check for possible deterioration and they are also analyzed to ensure that the boron has not leached from the plates.” The current CLB commitment along with continued monitoring of industry operating experience will provide adequate assurance that any age related degradation of the B4C will be detected.
0511	The new fuel storage racks are located in a dry mild environment inside the new fuel storage vault. The new fuel storage racks are made from aluminum with stainless steel fasteners. The use of stainless steel fasteners in aluminum to avoid detrimental galvanic corrosion in a predominantly air environment, is a recommended practice and has been used successfully for many years by the aluminum industry.
0512	The AMP manages loss of material due to crevice and pitting corrosion. Cracking due to SCC is not applicable. Spent fuel pool water level monitoring is per Technical Specifications. Leak chase channel monitoring is via operator rounds.
0513	The gates experience the same environment as the spent fuel pool liner. The BWR Water Chemistry Program manages Loss of material due to crevice and pitting corrosion. Cracking due to SCC is not applicable. Since the gates are part of the fuel pool water containment boundary, monitoring of fuel pool level and leak chase channels activities also indirectly manage this component.
0514	This NUREG-1801 item specifies the AMP is to be augmented by a “One-Time Inspection.” Augmented One-time inspection is not applicable to the spent fuel pool since it is not a low flow or stagnant flow area. Also, NUREG-1801 Chapter VII.A2 Spent Fuel Storage does not require Water Chemistry to be augmented by a “One-Time Inspection.” Augmented inspection applies to piping, piping components, and piping elements, not the spent fuel racks or gates.
0515	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. Chapter II or Chapter III of NUREG-1801 does not list exposed to raw water environment for stainless steel components. The identified AMP is used to manage aging effects for the period of extended operation.
0516	The lead panels are encapsulated within stainless steel casing.
0517	The shield walls at Columbia are made up of free-standing or stacked solid bricks (blocks) sandwiched between metal (siding) panels. The panel sections (and blocks) are held in place under all load conditions by angle sections anchored to the concrete wing walls at the pipe chases. Concrete block shield walls do not function like a typical block wall within a structure and are not subjected to degradations found from industry experience (i.e., aging effects cited in IEB 80-11.)

Plant-Specific Notes:	
0518	Columbia is not committed to RG 1.127 Inspection of Water Control Structures Associated with Nuclear Power Plants, Revision 1. However, the Structures Monitoring Program will be enhanced to include the inspection elements delineated in RG 1.127, Revision 1 per NUREG-1801 Chapter XI.S7.
0519	The NUREG-1801 item for freeze-thaw does not list exposed to raw water environment for water-control structures. Freeze-thaw can be possible near the water line. This environment is both exposed to weather and exposed to raw water; therefore, the environment is a match. The identified AMP is used to manage aging effects for the period of extended operation.
0520	Concrete component submerged in raw water is not susceptible to freeze-thaw. No applicable aging effects have been identified for the component type. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.
0521	The indicated aging effects (cracking and change in material properties due to irradiation) requiring management are only applicable to component types within the Radwaste Control Building charcoal absorber zones (i.e., Zone E at el. 437'-0" and Zone K at elevation 467'-0"). Radiation values are the worst case surface (contact) doses for the indicated zones. The identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.
0522	Loss of material due to crevice corrosion and pitting corrosion is not an aging effect requiring management for aluminum exposed to air-outdoor since Columbia is located in an in-land rural environment and not exposed to aggressive environmental conditions. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.
0523	Lubrite material resists deformation, has a low coefficient of friction, resists softening at elevated temperatures, absorbs grit and abrasive particles, is not susceptible to corrosion, withstands high intensities of radiation, and will not score or mar. The Lubrite lubricants used in nuclear applications are designed for the environments to which they are exposed. There are no known aging effects that would lead to a loss of intended function. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.
0524	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. NUREG-1801 does not list exposed to raw water environment for support components. The identified AMP is used to manage aging effects for the period of extended operation.
0525	The NUREG-1801 item lists Loss of material as an aging effect. This aging effect was determined not applicable since Columbia is located in an in-land rural environment and is not exposed to aggressive environmental conditions. Component external surfaces are not continuously wetted or exposed to an aggressive ambient environment (such as a saltwater atmosphere, sulfur dioxide, etc.) or industrial locations. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.
0526	The roof is insulated or has built-up roofing. Therefore, environment for this concrete roof slab is "air-indoor" for underside of slab. Roof membrane is evaluated and addressed in bulk commodities.

Plant-Specific Notes:	
0527	NUREG-1801 lists loss of sealing aging effect for elastomer. Loss of sealing is not an aging effect, but rather a consequence of elastomer degradation. This effect can be caused by cracking or change in material properties for elastomeric material. Note C is used since the NUREG-1801 item is intended for Group 6 - water-control structures' components; the line item covers all in-scope structures.
0528	Ionizing radiation is an applicable aging mechanism for elastomers located in areas where the radiation exceeds threshold. Ionizing radiation mechanism does not apply to elastomers located in mild radiation areas.
0529	Cracking and Change in material properties due to ultraviolet radiation and ozone are applicable aging effects for rubber only.
0530	The aging mechanism Loss of material due to wear is not an aging effect for fire doors based on EPRI Report 1015078 "Aging Effects for Structures and Structural Components (Structural Tools)." The aging mechanism Loss of material due to general corrosion was not specified in the corresponding NUREG-1801 item as an aging effect requiring management. Generic Note "A" was used to align to the NUREG-1801 item since the material, environment, aging effect, and program matches. The identified AMP will be used to manage Loss of material due to general corrosion and will confirm the absence of significant wear of fire doors for the period of extended operation. The Fire Protection Program inspects for excessive wear of latches, strike plates, hinges, sills, and closing devices, and proper clearances (gaps) between the door, frame, and threshold.
0531	Plant-specific Tefzel tie wraps test report and engineering evaluation concluded Tefzel (fluorpolymer) tie wraps met environmental qualification requirements. Tefzel product performance was demonstrated by meeting the tensile strength requirements specified in the test report where it was subjected to normal life, accident and post accident conditions. Both the temperature and radiation capabilities exceed the maximum temperature and 60 years total integrated dose values, therefore based on plant-specific environmental qualification test results and plant engineering evaluation there are no aging effects requiring management for Tefzel cable tie wraps.
0532	Per plant procedure, nylon tie wraps may be used for applications outside the Radiologically Controlled Area (RCA) where they will not be exposed to environmental stresses such as extreme temperatures, ultraviolet radiation, or harsh chemicals. The temperature capability of nylon tie wraps exceeds the maximum temperature values for non-RCA areas, therefore there are no aging effects requiring management for nylon cable tie wraps.
0533	Components are the stainless steel missile deflectors for the spent fuel rack vents which are not within the scope of ISI-IWF. The identified AMPs will be used to manage the aging effects for the period of extended operation.
0534	The Thermo-Lag fire wraps at Columbia are abandoned in place. There are a few tray nodes where Thermo-lag is credited as electrical separation barrier, but not for Post-Fire Safe Shutdown. Siltemp tapes and Flame-Safe blankets are also used as electrical separation barriers.

[This page intentionally blank]

3.6 AGING MANAGEMENT OF ELECTRICAL AND INSTRUMENTATION AND CONTROL SYSTEMS

3.6.1 Introduction

Section 3.6 provides the results of the aging management reviews (AMRs) for those components and commodities identified in Section 2.5, Scoping and Screening Results – Electrical and Instrumentation and Control Systems, subject to AMR. The components and commodity groups subject to AMR are:

- Non-Environmentally Qualified Insulated Cables and Connections (Section 2.5.5.1)
- Metal-Enclosed Bus (Section 2.5.5.2)
- Switchyard Bus and Connections (Section 2.5.5.3)
- Transmission Conductors and Connections (Section 2.5.5.4)
- Uninsulated Ground Conductors and Connections (Section 2.5.5.5)
- High-Voltage Insulators (Section 2.5.5.6)

Table 3.6.1, Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component and commodity groups in this section. Text addressing summary items requiring further evaluation is provided in Section 3.6.2.2.

3.6.2 Results

The following table summarizes the results of the AMR for the components and commodity groups in the Electrical and Instrumentation and Control Systems area:

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups

3.6.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The materials from which specific components and commodity groups are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each component and commodity group in the following sections.

3.6.2.1.1 Non-Environmentally Qualified Insulated Cables and Connections

The Non-Environmentally Qualified Insulated Cables and Connections commodity group is subdivided for AMR into the following categories:

- Non-Environmentally Qualified Insulated Cables and Connections
- Non-Environmentally Qualified Sensitive, High-Voltage, Low-Level Signal Instrument Cables and Connections
- Non-Environmentally Qualified Medium-Voltage Power Cables
- Cable Connections (Metallic Parts)
- Fuse Holders (Insulation)
- Fuse Holders (Metallic Clamp)

Materials

The materials of construction for the Non-Environmentally Qualified Insulated Cables and Connections are:

- Various Organic Polymers
- Various Metals
- Silicon Dioxide
- Copper Alloy (fuse holder metallic clamp)

Environments

The Non-Environmentally Qualified Insulated Cables and Connections are exposed to the following environments:

- Adverse localized environments
- Air – indoor uncontrolled
- Air - outdoor

Aging Effects Requiring Management

The aging effects requiring management for the Non-Environmentally Qualified Cables and Connections exposed to adverse localized environments are the following:

- Electrical Failure
- Localized Damage and Breakdown of Insulation
- Loosening of Bolted Connections

- Reduced Insulation Resistance

Aging Management Programs

The following aging management programs manage the aging effects for the Non-Environmentally Qualified Cables and Connections components:

- Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program
- Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection
- Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program

3.6.2.1.2 Metal-Enclosed Bus

The Metal-Enclosed Bus commodity group is subdivided for AMR into the following categories:

- Metal-Enclosed Bus, Non-Segregated (Bus and Connections)
- Metal Enclosed Bus, Non-Segregated (Enclosure Assemblies)
- Metal-Enclosed Bus, Non-Segregated (Insulation and Insulators)

Materials

The materials of construction for the Metal-Enclosed Bus components are:

- Aluminum
- Copper
- Silver Plate
- Elastomers
- Fiberglass
- Galvanized Steel
- Porcelain
- Steel
- Stainless Steel

- Various Organic Polymers (EPR and PVC tape)

Environments

The Metal-Enclosed Bus components are exposed to the following environments:

- Air - indoor uncontrolled
- Air - outdoor

Aging Effects Requiring Management

The following aging effects require management for the Metal-Enclosed Bus components:

- Electrical Failure
- Hardening and Loss of Strength
- Loosening of Bolted Connections
- Loss of Material
- Reduced Insulation Resistance

Aging Management Programs

The following aging management programs manage the aging effects for the Metal-Enclosed Bus components:

- Metal-Enclosed Bus Program
- Structures Monitoring Program

3.6.2.1.3 Switchyard Bus and Connections

The Switchyard Bus and Connections commodity group is evaluated for aging management as follows:

Materials

The materials of construction for the Switchyard Bus and Connections are:

- Aluminum
- Galvanized steel

Environments

The Switchyard Bus and Connections are exposed to the following environment:

- Air - outdoor

Aging Effects Requiring Management

There are no aging effects identified as requiring management for the Switchyard Bus and Connections components (See Section 3.6.2.2.3).

Aging Management Programs

There are no aging effects identified as requiring management; therefore, no aging management programs are required for the Switchyard Bus and Connections components.

3.6.2.1.4 Transmission Conductors and Connections

The Transmission Conductors and Connections commodity group is evaluated for aging management as follows:

Materials

Transmission conductors are Type ACSR (aluminum conductor steel reinforced). The materials of construction for the Transmission Conductor and Connection components are:

- Aluminum
- Galvanized Steel
- Stainless Steel

Environments

The Transmission Conductor and Connection components are exposed to the following environment:

- Air - outdoor

Aging Effects Requiring Management

There are no aging effects identified as requiring management for the Transmission Conductor and Connection components (See Section 3.6.2.2.3).

Aging Management Programs

There are no aging effects identified as requiring management; therefore, no aging management programs are required for the Transmission Conductors and Connections components.

3.6.2.1.5 Uninsulated Ground Conductors and Connections

The Uninsulated Ground Conductors and Connections commodity group is evaluated for aging management as follows:

Materials

The material of construction for the Uninsulated Ground Conductors and Connections is:

- Copper

Environments

The Uninsulated Ground Conductors and Connections are exposed to the following environments:

- Air – outdoor
- Soil

Aging Effects Requiring Management

There are no aging effects identified as requiring management for the Uninsulated Ground Conductors and Connections components.

Aging Management Programs

There are no aging effects identified as requiring management; therefore, no aging management programs are required for the Uninsulated Ground Conductors and Connections components.

3.6.2.1.6 High-Voltage Insulators

The High-Voltage Insulators commodity group is evaluated for aging management as follows:

Materials

The materials of construction for the High-Voltage Insulators are:

- Cement
- Galvanized Metal

- Porcelain
- Stainless Steel

Environments

The High-Voltage Insulators are exposed to the following environment:

- Air - outdoor

Aging Effects Requiring Management

The following aging effect requires management for the High-Voltage Insulator components:

- Degradation of Insulator Quality

Aging Management Programs

The following aging management program manages the aging effects for the High-Voltage Insulator components:

- High-Voltage Porcelain Insulators Aging Management Program

3.6.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

For the electrical and instrumentation and control (I&C) components, the items that require further evaluation are addressed in the following sections.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

Analyses for environmental qualification of components with qualified lives of 40 years or greater are time-limited aging analyses, as defined in 10 CFR 54.3. The time-limited aging analyses are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this time-limited aging analysis is addressed in Section 4.4, Environmental Qualification of Electrical Equipment.

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

For Columbia, the deposition of contaminants on the high voltage insulators (in the 500-kV system) in the plant transformer yard has caused plant trips in the past. The root cause evaluations concluded that the specific meteorological conditions (i.e., the wind and temperature) at the time, along with the associated plume from the cooling towers (which slumped over the power block into the transformer yard), allowed a coating of ice to form, which also trapped liquid water containing minerals on the surface of the insulators, thereby allowing electrical tracking to occur. The corrective action was to implement a program to clean the insulators every two years. The event re-occurred on the 500-kV system. Additional testing was performed, which resulted in developing a coating system that has proven effective in mitigating the flashover when reapplied at least every 10 years.

Due to the operating experience with the 500-kV system, Columbia instituted a program to clean the high voltage insulators on the 115-kV system, identified for license renewal as the plant-specific High-Voltage Porcelain Insulators Aging Management Program, in order to manage the build-up of hard water residue from the cooling tower plume, and thereby mitigate potential degradation of the insulation function. This program allows for the option to either hand clean the in-scope high voltage insulators every two years or to coat the insulators every 10 years and inspect the coating for damage every two years between coatings. The operating experience indicates that this is only an issue with station post insulators. There are no station post insulators associated with the 230-kV system in the Columbia transformer yard, therefore the 230-kV system is excluded.

Loss of material due to mechanical wear is an aging effect for certain strain insulators if they are subject to significant movement. Such movement of the insulators can be caused by wind blowing the supported transmission conductor, causing it to sway from side to side. If this swinging motion occurs frequently enough, it could cause wear on the metallic contact points of the insulator string and between an insulator and the supporting hardware. Although this aging mechanism is possible, industry experience has shown that transmission conductors do not normally swing unless subjected to a substantial wind, and they stop swinging shortly after the wind subsides. Wind loading that can result in conductor sway is considered in the transmission system design. For insulators that are associated with switchyard bus, movement is precluded by the rigid design of the switchyard bus (i.e., the bus is of short length, is rigid itself, and is connected to rigid components). Review of operating experience has identified no concerns related to the occurrence of loss of material due to mechanical wear as a result of wind blowing on transmission conductors and the switchyard high voltage insulators. Therefore, loss of material due to mechanical wear is not an aging effect requiring management for the high voltage insulators at Columbia.

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

The switchyard bus which connects Back-up Transformer E-TR-B to circuit breaker E-CB-TRB and the bus between the 230 kV overhead line and circuit breaker A809 is within the scope of license renewal at Columbia. These are aluminum tube. The switchyard bus is connected to flexible connectors that do not normally vibrate and are supported by insulators and ultimately by structural components such as concrete footings and structural steel. With no connection to moving or vibrating equipment, vibration is therefore not an applicable aging mechanism. The aluminum bus will form a very thin surface layer of oxidation, but the tube itself does not oxidize and the conductor properties are not degraded by a thin surface oxidation layer. The Columbia applications incorporate the use of galvanized or stainless steel “Belleville” washers on bolted electrical connections using galvanized or stainless steel bolts, nuts, and washers to compensate for temperature changes and to maintain the proper tightness. The bolted connections are exposed to the ambient service conditions in the switchyard bus locations at Columbia (in the plant transformer yard and in the Ashe substation), and do not experience any aging effects that require management.

From EPRI TR-104213 (“Bolted Joint Maintenance & Applications Guide”), Section 15.7.5.3, ANSI B18.21.1 (“Lock Washers”) has not changed since 1972. Prior to that year, it was designated ASA B27.1 (1965). The specification was changed in 1972 regarding embrittlement. Prior to 1972, there was no statement made to prevent possible hydrogen embrittlement if the washers were plated. Because construction of the Columbia transformer yard post-dates 1972, there is strong assurance that the washers used at Columbia are not subject to hydrogen embrittlement.

Wind-induced abrasion and fatigue are not aging effects applicable to the in-scope transmission conductors. Industry experience has shown that transmission conductors do not normally swing unless subjected to substantial winds, and they stop swinging after a short period once the wind subsides. Because the transmission conductors are not normally moving, the loss of material due to wind-induced abrasion and fatigue is not an aging effect requiring management.

Loss of conductor strength due to corrosion of the transmission conductor is not identified as an aging effect due to ample design margin and a minimal corrosion process at the rural location of Columbia. Connection resistance is not identified as a stressor based on use of good bolting practices and review of site operating experience.

EPRI Report 1013475, the License Renewal Electrical Handbook, concludes that the most prevalent aging mechanism contributing to loss of conductor strength of ACSR (aluminum conductor steel reinforced) transmission conductors is corrosion. For ACSR conductors, degradation begins as a loss of zinc from the galvanized steel core wires. Corrosion rates depend largely on air quality, which involves suspended particles in the air, sulfur dioxide (SO_2) concentration, rain, fog chemistry, and other weather conditions. Corrosion of ACSR conductors is a very slow process that is even slower in rural areas with less air pollution. Columbia is located in a rural area in east-central Washington state, where airborne particle concentrations are low.

Tests performed by Ontario Hydroelectric showed a 30 percent composite loss of conductor strength for an 80 year-old sample of an ACSR conductor (due to corrosion). The Ontario Hydroelectric Test Report is available from the Institute of Electrical and Electronics Engineers (IEEE). The report is documented in two parts in the IEEE Transactions on Power Delivery, Volume 7, Number 2, April 1992©. The papers present the test methods and results of both field and laboratory tests on samples of ACSR (aluminum conductor steel reinforced) conductors from Ontario Hydroelectric's older transmission lines. The field testing involved detection of steel core galvanizing loss via the use of an overhead line conductor corrosion detector. Laboratory tests (using a dynamometer) were performed for fatigue, tensile strength, torsional ductility, and electrical performance. The report also addressed metallurgical data and analysis of potential environmental contributors.

With respect to the Ontario Hydroelectric study, the National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60 percent of the ultimate conductor strength and that consideration for ice, wind, and temperature be included in the design. The discussion in EPRI 1013475 demonstrates that with a 30 percent loss of conductor strength, there is still margin between the NESC requirements and the actual conductor strength. Because the Columbia transmission conductor design and installation meets the NESC requirements, the Ontario Hydroelectric study bounds the Columbia configuration. The specific comparisons are addressed below.

The transmission conductors within the scope of license renewal are "Drake" ACSR 795 MCM (thousand circular mils) with a 26/7 stranding (for the 230-kV system). The Ontario Hydro testing included ACSR with the same stranding configuration as the Columbia transmission conductors. The Columbia transmission conductors have an ultimate strength of 31,200 pounds for the "Drake" configuration. The "Drake" conductor has a maximum design working tension of 8,000 pounds. Because the Ontario Hydro study demonstrated a 30 percent loss of ultimate strength in an 80 year-old conductor, the Columbia transmission conductors are shown to demonstrate the following:

Normal margin (ultimate versus maximum design tension):

"Drake" - (31,200 – 8,000) / (31,200) = 0.74 x 100 = 74 percent

Aged margin (assuming a 30 percent loss of ultimate strength):

"Drake" - [(0.7)*(31,200) – 8,000] / [(31,200)*(0.7)] = 0.63 x 100 = 63 percent

This demonstrates that (using the Ontario Hydroelectric test data) the Columbia transmission conductors will have greater than 63 percent ultimate strength margin remaining after 80 years.

Therefore, based on the expected low corrosion rates due to plant location and the margins included in the design, corrosion of the transmission conductors is not an aging effect requiring management for the period of extended operation.

Increased connection resistance is not identified as an aging effect requiring management. Bolted connections associated with the transmission conductors employ the use of good bolting practices consistent with the recommendations of EPRI 1003471, "Electrical Connector Application Guidelines." The preferred hardware for the connections is stainless steel. The Columbia applications incorporate the use of stainless steel "Belleville" washers on bolted electrical connections using stainless steel bolts, nuts, and washers to compensate for temperature changes and to maintain the proper tightness. Aluminum hardware is also used for aluminum to aluminum bus connections, but stainless steel is preferred. Use of aluminum fasteners with aluminum bus minimizes any differences in thermal expansion that could lead to loss of pre-load. In addition, design installation drawings provide guidance on bolted joints (copper to aluminum, aluminum to aluminum, and aluminum to copper). Design documents also require the use of an electrical joint compound, to be used in accordance with the manufacturer's recommendations. These methods of assembly (particularly the use of the "Belleville" washers) are consistent with EPRI 1003471. The review of site operating experience revealed no bolted connection failures associated with transmission conductors.

3.6.2.2.4 Quality Assurance for Aging Management of Non-safety Related Components

Quality Assurance provisions applicable to license renewal are discussed in Appendix B, Section B.1.3.

3.6.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the electrical and I&C components. The section of the application that contains the time-limited aging analysis review results is indicated in parentheses.

- Analyses for Environmental Qualification of components with a qualified life of 40 years or greater (Section 4.4, Environmental Qualification of Electrical Equipment)

3.6.3 Conclusions

The electrical and I&C components and commodities subject to aging management review have been identified in accordance with 10 CFR 54.21. The aging management programs selected to manage the effects of aging for the electrical components and commodities are identified in the following tables and Section 3.6.2.1. 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 electrical and I&C components and commodities will be managed so 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 3.6.1 Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-01	Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements	Degradation due to various aging mechanisms	Environmental Qualification of Electrical Components	Yes, TLAA	This TLAA is evaluated in Section 4.4. Refer to Section 3.6.2.2.1 for further information.
3.6.1-02	Electrical cables, connections, and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements	Reduced insulation resistance 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.
3.6.1-03	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 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.
3.6.1-04	Conductor insulation for inaccessible medium voltage (2-kV to 35-kV) 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.

Table 3.6.1 Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-05	Connector contacts for electrical connectors exposed to borated water leakage	Corrosion of connector contact surfaces due to intrusion of borated water	Boric Acid Corrosion	No	Not applicable for Columbia. Columbia is a BWR and does not use boric acid in any systems. The Standby Liquid Control System uses a sodium pentaborate solution (a mixture of boric acid and borax) that is not aggressive to metals.

Table 3.6.1 Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-06	Fuse Holders (Not Part of a Larger Assembly): Fuse Holders – metallic clamp	Fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	Fuse Holders	No	Not applicable for Columbia. The aging effects detailed in NUREG-1801 are not applicable for this item. None of the fuse holders that are within the scope of license renewal contain fuses that are frequently manipulated. Inspection of a sample of the passive fuse boxes found the condition to be clean and dry, with no signs of contamination or corrosion or moisture intrusion. Similarly, ohmic heating, thermal cycling, electrical transients, and vibration do not apply to the passive fuse boxes at Columbia because the fuses are not heavily loaded (in their installed applications) and do not experience frequent electrical and thermal cycling. Power fuses are bolted to maintain electrical contact. Vibration is an induced aging mechanism, and is not applicable because the electrical boxes are securely mounted on walls.

Table 3.6.1 Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-07	Metal-enclosed bus – Bus/connections	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal-Enclosed Bus	No	Consistent with NUREG-1801, with exceptions. The Metal-Enclosed Bus Program is credited.
3.6.1-08	Metal-enclosed bus – Insulation/insulators	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Metal-Enclosed Bus	No	Consistent with NUREG-1801, with exceptions. The Metal-Enclosed Bus Program is credited..
3.6.1-09	Metal-enclosed bus – Enclosure assemblies	Loss of material due to general corrosion	Structures Monitoring Program	No	Consistent with NUREG-1801.
3.6.1-10	Metal-enclosed bus – Enclosure Assemblies	Hardening and loss of strength due to elastomer degradation	Structures Monitoring Program	No	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited. The Metal-Enclosed Bus Program is credited.

Table 3.6.1 Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-11	High-Voltage Insulators	Degradation of insulation quality due to the presence of any salt deposits and surface contamination; Loss of material caused by mechanical wear due to wind blowing on transmission conductors	A plant-specific aging management program is to be evaluated	Yes, plant-specific	The High-Voltage Porcelain Insulators Aging Management Program is credited. Loss of material due to wear is not an applicable aging effect for the in-scope high-voltage insulators at Columbia. Refer to Section 3.6.2.2.2 for further information.
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 pre-load	A plant-specific aging management program is to be evaluated	Yes, plant-specific	No aging effects are identified as requiring aging management. Refer to Section 3.6.2.2.3 for further information.

Table 3.6.1 Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801, with exceptions. See Appendix B Section B.2.21.
3.6.1-14	Fuse Holders (Not Part of a Larger Assembly) – Insulation Material	None	None	N/A – No AEM or AMP	Consistent with NUREG-1801.

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Cable Connections (Metallic Parts)	Conduct Electricity	Various Metals (used for electrical contact)	Air – indoor uncontrolled and Air - outdoor	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 EQ Requirements Inspection	VI.A-1	3.6.1-13	B

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
2	Non-Environment-ally Qualified Insulated Cables and Connections	Conduct Electricity	Various Organic Polymers Silicon Dioxide	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation of organics (thermal/ thermoxidative) radiolysis and photolysis (UV-sensitive materials only) of organics; radiation-induced oxidation, and moisture intrusion	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program	VI.A-2	3.6.1-02	A

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
3	Non-Environment-ally Qualified Sensitive, High-Voltage, Low-Level Signal Instrument Cables and Connections	Conduct Electricity	Various Organic Polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation of organics (thermal/ thermoxidative) radiolysis and photolysis (UV-sensitive materials only) of organics; radiation-induced oxidation, and moisture intrusion	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program	VI.A-3	3.6.1-03	A

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
4	Non-Environment-ally Qualified Medium-Voltage Power Cables	Conduct Electricity	Various Organic Polymers	Adverse localized environment caused by exposure to moisture and voltage	Localized damage and breakdown of insulation leading to electrical failure / moisture intrusion, water trees	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program	VI.A-4	3.6.1-04	A

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
5	Fuse Holders: Insulation	Conduct Electricity	Various Organic Polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen or > 60-year service limiting temperature	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation (thermal/ thermoxidative) of organics/ thermoplastics; radiation-induced oxidation, moisture intrusion, and ohmic heating	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program	VI.A-6	3.6.1-02	A
6	Fuse Holders: Insulation	Conduct Electricity	Various Organic Polymers	Air – indoor uncontrolled	None Identified	None Required	VI.A-7	3.6.1-14	A

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Fuse Holders: Metallic Clamp	Conduct Electricity	Copper Alloy	Air - Indoor uncontrolled	None Identified	None Required	VI.A-8	3.6.1-06	I 0603 0607
8	High-Voltage Insulators	Insulation (and support)	Porcelain, Galvanized Metal, Stainless Steel, Cement	Air - Outdoor	Degradation of insulator quality / presence of any salt deposits or surface contamination	High-Voltage Porcelain Insulators Aging Management Program	VI.A-9	3.6.1-11	E 0608
9	High-Voltage Insulators	Insulation (and support)	Porcelain, Galvanized Metal, Stainless Steel, Cement	Air - Outdoor	None Identified	None Required	VI.A-10	3.6.1-11	I 0601
10	Metal-Enclosed Bus (bus and connections) (non-segregated)	Conduct Electricity	Aluminum / Silver Plated Aluminum, Copper / Silver Plated Copper, Stainless Steel, Steel	Air - Indoor uncontrolled and Air - Outdoor	Loosening of bolted connections / thermal cycling and ohmic heating	Metal-Enclosed Bus Program	VI.A-11	3.6.1-07	B

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
11	Metal-Enclosed Bus (Enclosure Assemblies) (non-segregated)	Support	Elastomers	Air - Indoor uncontrolled and Air - Outdoor	Hardening and loss of strength / elastomer degradation	Metal-Enclosed Bus Program	VI.A-12	3.6.1-10	E 0605
12	Metal-Enclosed Bus (enclosure assemblies) (non-segregated)	Support	Aluminum, Steel, Galvanized Steel	Air - Indoor uncontrolled and Air - Outdoor	Loss of material / general corrosion	Structures Monitoring Program	VI.A-13	3.6.1-09	A 0605 0606

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
13	Metal-Enclosed Bus (insulation and insulators) (non-segregated)	Insulation	Porcelain, Fiberglass, Various Organic Polymers (EPR and PVC tape)	Air - Indoor uncontrolled and Air - Outdoor	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ thermal/ thermoxidative degradation of organics/ thermoplastics; radiation-induced oxidation; moisture/ debris intrusion, and ohmic heating	Metal-Enclosed Bus Program	VI.A-14	3.6.1-08	B
14	Switchyard Bus and Connections	Conduct Electricity	Aluminum, Galvanized Steel	Air - Outdoor	None Identified	None Required	VI.A-15	3.6.1-12	I 0602

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
15	Transmission Conductors and Connections	Conduct Electricity	Aluminum, Galvanized Steel, Stainless Steel	Air - Outdoor	None Identified	None Required	VI.A-16	3.6.1-12	I 0604
16	Uninsulated Ground Conductors and Connections	Conduct Electricity	Copper	Air – Outdoor and Soil	None Identified	None Required	N/A	N/A	J 0609
17	Electrical Equipment Subject to 10 CFR 50.49 EQ Requirements	Various	Various organic polymers and metallic materials	Adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage	Various degradations / various mechanisms	TLAA	VI.B-1	3.6.1-01	A

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 takes some 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 takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes:	
0601	Loss of material due to wear is not an applicable aging effect for the in-scope high-voltage insulators at Columbia - see Section 3.6.2.2.2 for evaluation.
0602	For the switchyard bus and connections, no aging effects are identified that require aging management - refer to Section 3.6.2.2.3 for evaluation.
0603	A review of the Columbia fuse list and other engineering documents showed that there are no in-scope passive fuses that are pulled on a routine basis such that deformation (fatigue) would cause loosening of the fuse holder. The in-scope fuse holders at Columbia are located in metallic electrical boxes (terminal boxes) which have covers to protect the interior of the box from the ambient environment. The boxes are not exposed to weather conditions (they are located indoors); they are not exposed to chemical contamination or spills; they are not exposed to mechanical stress inside the box; and, due to the Columbia location in rural central Washington, they are not located in an evironment with industrial pollution or salt deposition. Therefore, chemical contamination, corrosion, and oxidation are not applicable aging mechanisms for the fuse holders within the license renewal scope at Columbia. With respect to electrical transients and ohmic heating, these fuses are not heavily loaded and do not experience frequent electrical and thermal cycling. With respect to vibration, it is an induced aging mechanism, and the fuse boxes are securely mounted on walls, so vibration itself is not an applicable stressor.
0604	The transmission conductors within the license renewal scope are those that connect start-up transformer E-TR-S to circuit breaker A 809 in the Ashe substation switchyard. This circuit breaker constitutes part of the station blackout license renewal boundary. This segment of transmission conductor does not exhibit significant aging mechanisms or effects. An aging management program is not required for the segment of transmission conductor that is within the scope of license renewal. See Section 3.6.2.2.3 for details.
0605	The inspection of the metal-enclosed bus enclosure assembly elastomers (joints, seals, gaskets) will be performed as part of the Metal-Enclosed Bus Program. The elastomers will be inspected when the covers of the various bus enclosure sections are removed. The Structures Monitoring Program will address the metallic portion of the enclosure assembly and the external structural supports for the various bus assemblies (along with the building penetrations and seals where the bus ducts enter the Reactor Building).
0606	In addition to steel and galvanized steel, Columbia uses aluminum enclosures (a material not mentioned in NUREG-1801, Item VI.A-13). Note A is used, because the Structures Monitoring Program includes consideration of aluminum and is consistent with NUREG-1801.
0607	Inspection of a sample of the passive fuse boxes within the scope of license renewal (performed in September 2007) showed that conditions are clean and dry, with no corrosion or moisture intrusion found.

Plant-Specific Notes:	
0608	See Section 3.6.2.2.2 for a description of the surface contamination item affecting the high-voltage insulators in the Columbia transformer yard.
0609	The uninsulated ground conductors and connections are included in the license renewal scope because they are required for fire protection (from lightning-induced fires) on certain structures and for facilitating the operation of ground fault detection devices in the event of ground fault or insulation failure on any electrical load or current (see Section 2.5.5.5). There are no aging effects requiring management for the metallic components of the uninsulated ground conductors and connections.

[This page intentionally blank]

4.0 TIME-LIMITED AGING ANALYSES

10 CFR 54 governs the issuance of renewed operating licenses for nuclear power plants and includes requirements for the performance of an integrated plant assessment (IPA) and the review of time-limited aging analyses. The results of the IPA and time-limited aging analysis (TLAA) evaluations form the technical bases upon which the Columbia Generating Station (Columbia) license renewal application is built.

This section provides the results of reviews of potential TLAAs and exemptions specific to Columbia for license renewal and documents evaluations of each identified item for the period of extended operation. This section dispositions each identified TLAA in accordance with 10 CFR 54.21(c).

[This page intentionally blank]

4.1 IDENTIFICATION OF TIME-LIMITED AGING ANALYSES

Time-limited aging analyses are defined in 10 CFR 54.3 as those licensee calculations and analyses that:

(1) Involve systems, structures, and components within the scope of license renewal, as delineated in 10 CFR 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 10 CFR 54.4(b); and
(6) Are contained or incorporated by reference in the CLB.

4.1.1 Time-Limited Aging Analyses Identification Process

The major emphasis in the License Renewal Rule (10 CFR 54) is that the CLB must be maintained during the period of extended operation. Time-limited aging analyses that are contained or incorporated by reference in the CLB at Columbia are identified, as required by 10 CFR 54. The CLB documentation that was searched to identify potential TLAAs includes the following:

- Final Safety Analysis Report (FSAR)
- Fire Protection Evaluation
- Quality Assurance Program
- In-Service Inspection Program
- Docketed Licensing Correspondence
- Operating License (including Technical Specifications)
- Code Exemptions and Relief Requests
- Design Calculations and Design Reports

Industry documents that list generic time-limited aging analyses were reviewed to provide additional assurance of the completeness of the plant-specific list. These documents include NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” Revision 1, NEI 95-10, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule,” Revision 6, Boiling Water Reactor Vessel and Internals Project

(BWRVIP) reports and recent license renewal applications for boiling water reactor designs.

Each potential TLAA identified is reviewed to determine if it meets the definition of a TLAA in accordance with 10 CFR 54.3. Columbia analyses and calculations that meet the TLAA definition are evaluated in accordance with the options provided in 10 CFR 54.21(c)(1).

4.1.2 Evaluation of Time-Limited Aging Analyses

As required by 10 CFR 54.21(c)(1), an evaluation of Columbia-specific TLAAs must be performed to 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.

The results of these evaluations are summarized in Table 4.1-1 and Table 4.1-2 and discussed in Sections 4.2 through 4.7.

4.1.3 Identification of Exemptions

Pursuant to 10 CFR 54.21(c)(2), an applicant for license renewal must provide: (1) a listing of plant-specific exemptions granted pursuant to 10 CFR 50.12 that are in effect and based on a TLAA, and (2) an evaluation of these exemptions to justify their continuation for the period of extended operation. Columbia current licensing basis documentation, identified in Section 4.1.1, was reviewed for exemptions.

As a result of the review, there were no exemptions identified that are based on a TLAA.

Table 4.1-1
Time-Limited Aging Analyses

Results of TLAA Evaluation by Category	10 CFR 54.21(c)(1) Paragraph	LRA Section
Reactor Vessel Neutron Embrittlement		4.2
Neutron Fluence	Not a TLAA	4.2.1
Upper Shelf Energy (USE)	(ii)	4.2.2
Adjusted Reference Temperature (ART)	(ii)	4.2.3
Pressure-Temperature (P-T) Limits	(iii)	4.2.4
Reactor Vessel Circumferential Weld Examination Relief	(ii)	4.2.5
Reactor Vessel Axial Weld Failure Probability	(ii)	4.2.6
Metal Fatigue		4.3
Reactor Pressure Vessel Fatigue Analyses	(iii)	4.3.1
Reactor Vessel Internals Fatigue Analyses	(iii)	4.3.2
Reactor Coolant Pressure Boundary Piping and Component Fatigue Analyses	(iii)	4.3.3
Non-Class 1 Component Fatigue Analyses	(i)	4.3.4
Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping	(iii)	4.3.5
Environmental Qualification of Electrical Equipment	(iii)	4.4
Concrete Containment Tendon Prestress	Not a TLAA	4.5
Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analyses		4.6
ASME Class MC Components	(i)	4.6.1
Downcomers	(i)	4.6.2
Safety Relief Valve Discharge Piping	(i)	4.6.3
Diaphragm Floor Seal	(i)	4.6.4
ECCS Suction Strainers	(i)	4.6.5
Other Plant-Specific Time-Limited Aging Analyses		4.7
Reactor Vessel Shell Indications	(iii)	4.7.1
Sacrificial Shield Wall	(ii)	4.7.2
Main Steam Line Flow Restrictor Erosion Analysis	(ii)	4.7.3

Table 4.1-2
Review of Generic TLAAs Listed in Tables 4.1-2 and 4.1-3 of NUREG-1800

NUREG-1800 Generic TLAAs Example	Applicability to Columbia	LRA Section
NUREG-1800, Table 4.1-2		
Reactor Vessel Neutron Embrittlement	Yes	4.2
Concrete Containment Tendon Prestress	No – Columbia does not have containment tendons	4.5
Metal Fatigue	Yes	4.3
Environmental Qualification of Electrical Equipment	Yes	4.4
Metal Corrosion Allowance	No – No explicit 40-year basis applies.	--
Inservice Flaw Growth Analyses that Demonstrate Structure Stability for 40 Years	Yes	4.7.1
Inservice Local Metal Containment Corrosion Analyses	No – No explicit 40-year basis applies.	--
High-Energy Line-Break Postulation Based on Fatigue Cumulative Usage Factor	Yes	4.3.3
NUREG-1800, Table 4.1-3		
Intergranular Separation in the Heat-Affected Zone (HAZ) of Reactor Vessel Low-Alloy Steel Under Austenitic Stainless Steel Cladding	No – No HAZ analysis was identified within the CLB.	--
Low-Temperature Overpressure Protection (LTOP) Analyses	No – No LTOP analysis was identified within the CLB.	--
Fatigue Analysis for the Main Steam Supply Lines to the Turbine-Driven Auxiliary Feedwater Pumps	No – Columbia is a BWR and does not have an Auxiliary Feedwater System.	--
Fatigue Analysis of the Reactor Coolant Pump Flywheel	No –Recirculation System pumps do not have flywheels.	--
Fatigue Analysis of Polar Crane	No – No explicit 40-year basis applies.	--

Table 4.1-2 (continued)
Review of Generic TLAAs Listed in Tables 4.1-2 and 4.1-3 of NUREG-1800

NUREG-1800 Generic TLAAs Example	Applicability to Columbia	LRA Section
NUREG-1800, Table 4.1-3 (cont.)		
Flow-Induced Vibration Endurance Limit for the Reactor Vessel Internals	No – No analyses were identified within the CLB for the reactor vessel internals related to this topic.	--
Transient Cycle Count Assumptions for the Reactor Vessel Internals	Yes	4.3.2
Ductility Reduction of Fracture Toughness for the Reactor Vessel Internals	No – No analyses were identified within the CLB for the reactor vessel internals related to this topic.	--
Leak Before Break	No – Columbia does not credit Leak Before Break.	--
Fatigue Analysis for the Containment Liner Plate	No – Columbia does not have a liner plate, but the metal shell is analyzed for fatigue.	4.6.1
Containment Penetration Pressurization Cycles	Yes	4.6.1
Reactor Vessel Circumferential Weld Inspection Relief (BWR)	Yes	4.2.5

[This page intentionally blank]

4.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

Neutron embrittlement is the term used to describe changes in mechanical properties of reactor vessel materials that result from exposure to fast neutron flux (E>1.0 MeV) within the beltline region. The most pronounced material change is a reduction in fracture toughness. As fracture toughness decreases with cumulative fast neutron exposure, the material's resistance to crack propagation decreases. Fracture toughness is also dependent on temperature. The reference temperature for nil-ductility transition (RT_{NDT}) is the temperature above which the material behaves in a ductile manner and below which the material behaves in a brittle manner. As fluence increases, RT_{NDT} increases. This means higher temperatures are required for the material to continue to act in a ductile manner.

The regulations governing reactor vessel integrity are in 10 CFR Part 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 Appendices G and H of 10 CFR 50.

The analyses associated with evaluation of the effect of neutron embrittlement on the Columbia reactor pressure vessel for 40 years are TLAAs. Neutron fluence, upper shelf energy (USE), adjusted reference temperature (ART), and vessel pressure-temperature (P-T) limits are time dependent parameters that must be investigated with respect to fracture toughness (embrittlement) of reactor vessel materials.

The following sections address fluence, USE, ART, P-T limits, circumferential welds, and axial welds for the reactor pressure vessel (RPV) beltline materials for the period of extended operation. This discussion uses the latest data, as submitted to the NRC on June 9, 2004 (Reference 4.8-1) and approved by the NRC in license amendment number 193 on May 12, 2005 (Reference 4.8-2). The latest data supersedes the information currently in the NRC's Reactor Vessel Integrity Database (RVID2).

4.2.1 Neutron Fluence

EFPY Projection

To evaluate the effects of radiation on RPV material embrittlement, the results of analyses were projected to determine neutron fluence out to 54 effective full power years (EFPY). Using actual reactor core power histories to-date and conservative estimates of future core designs, extended operation to 60 years will be bounded by 54 EFPY. (Reaching 54 EFPY would require a plant capacity factor in excess of 95 percent from now until the end of the period of extended operation.)

Fluence Projection

Fluence values at 51.6 EFPY of reactor operation (analyzed by General Electric (GE) in Reference 4.8-3) are addressed in FSAR Section 4.3.2.8 and FSAR Table 4.3-1. These fluence analyses are based on the original licensed thermal power of 3323 megawatt-thermal (MWt) through fuel cycle 10, and the currently licensed thermal power uprated to 3486 MWt from cycle 11 through the end of operation. These fluence analyses are based on the methodology of NEDC-32983P, "General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluation." NEDC-32983P was approved by NRC letter (Reference 4.8-4) with acceptability based on the fact that the methodology followed the guidance in Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence."

Subsequently, GE incorporated the fluence analyses into a personal computer worksheet to allow production of fluence estimates at other EFPY. For purposes of license renewal, the reported fluence was linearly extrapolated from 33.1 EFPY (the original 40-year end of life estimate) through 51.6 EFPY to 54 EFPY. Those projections match the fluence values obtained from the automated worksheet for 54 EFPY.

A summary of the highest estimated values of fluence for the RPV beltline shells and welds is shown in Table 4.2-1. Fluence is calculated at the inner surface (0T) of the vessel and at ¼ thickness (1/4T) depth into the vessel.

Beltline Evaluation

NUREG-1801 indicates that ferritic materials for RPV beltline shells, welds, and assembly components are to be evaluated for neutron irradiation embrittlement if high energy neutron fluence is greater than a threshold value of 1E+17 n/cm^2 (E >1 MeV) at the end of the license renewal term. The only RPV assembly items, other than the shells and welds in Table 4.2-1, that would experience neutron fluence greater than 1E+17 n/cm^2 during the period of extended operation are instrumentation nozzle N12 and residual heat removal/low-pressure coolant injection (RHR/LPCI) nozzle N6.

Instrumentation nozzle N12 has a thickness less than 2.5 inches and therefore requires no fracture toughness evaluation per ASME Code Appendix G, Section G2223, and thus is not evaluated.

Nozzle N6 is evaluated for ART in Section 4.2.3 and Table 4.2-5 below. As shown in Table 4.2-5, the ART for these nozzles is only 22.2 °F, versus 53.8 °F for the highest weld and 73.6 °F for the highest plate. Consequently, nozzle N6 is not the limiting material for the vessel. However, as nozzle N6 was evaluated for ART it meets the definition of a beltline component per 10 CFR 50, Appendix G.

As such, the beltline definition for the period of extended operation includes the lower shell, lower-intermediate shell, associated vertical (longitudinal) welds, the girth (circumferential) weld that connects the lower and lower-intermediate shells, and nozzle N6.

Disposition: Neutron fluence is not a TLAA. It is a time-limited assumption used in various neutron embrittlement TLAAs.

Table 4.2-1
RPV Beltline Fluence Values at 54 EFPY

PLATES :	Identification (I.D.) No.	0T fluence (n/cm^2)	1/4T fluence (n/cm^2)
Lower Shell	Mk 21-1-1, Mk 21-1-2, Mk 21-1-3, Mk 21-1-4	4.78E+17	2.71E+17
Lower-Intermediate Shell	Mk 22-1-1, Mk 22-1-2, Mk 22-1-3, Mk 22-1-4	1.17E+18	8.10E+17
NOZZLES:			
N6 (RHR / LPCI) (3 nozzles)	Mk 64-1	6.49E+17	4.48E+17
WELDS:			
Lower Vertical (Axial / Longitudinal)	BA, BB, BC, BD	4.78E+17	2.71E+17
Lower-Intermediate Vertical (Axial / Longitudinal)	BE, BF, BG, BH	1.17E+18	8.10E+17
Lower to Lower-Intermediate Girth (Circumferential)	AB	4.78E+17	3.3E+17

4.2.2 Upper Shelf Energy Evaluation

10 CFR 50 Appendix G requires the USE of the RPV beltline materials to remain above 50 ft-lb at all times during plant operation, including the effects of neutron radiation. If USE cannot be shown to remain above this limit, then an equivalent margin analysis (EMA) must be performed to show that the margins of safety against fracture are equivalent to those required by Appendix G of Section XI of the ASME Code.

The USE calculation of record for the existing licensed period (33.1 EFPY) is Appendix F of GE NEDO-33144 (Reference 4.8-5). The initial (unirraditated) USE is not known for all the Columbia vessel plates and welds. For those plates and welds for which the initial USE is known, USE was projected using Regulatory Guide 1.99, Revision 2 methods. For the vessel plates and welds for which the initial USE is not known, USE EMAs were performed using the Boiling Water Reactor Owners Group EMA methodology. Results from the testing and analysis of surveillance materials were used in the EMA analyses.

The values of USE projected to 54 EFPY are listed in Table 4.2-2. All of the projected USE values from Table 4.2-2 remain above 50 ft-lbs through the end of the period of extended operation (54 EFPY).

The projected EMAs are listed in Table 4.2-3 and Table 4.2-4. The projected EMAs in Table 4.2-3, and Table 4.2-4 used the projected 54 EFPY fluence listed in Table 4.2-1, and the curves provided in RG 1.99 Figure 2. The predicted values were compared to the minimum 54 EFPY USE limits in BWRVIP-74-A.

For the vessel beltline plates, the maximum decrease in USE was found to be 13.2 percent (see Table 4.2-3). This is less than the assumed decrease of 23.5 percent in the beltline plate equivalent margin analysis. Therefore, the maximum predicted decreases in USE for 54 EFPY for the beltline plates are bounded by the generic 54 EFPY equivalent margin analysis documented in BWRVIP-74-A. The projected USE for the vessel beltline plates is acceptable for the period of extended operation.

For the welds associated with the vessel beltline plates, the maximum decrease in USE was found to be 21.6 percent (see Table 4.2-4). This is less than the assumed decrease of 39 percent in the equivalent margin analysis. Therefore, the maximum predicted decreases in USE for the welds in the vessel beltline region are bounded by the generic 54 EFPY equivalent margin analysis documented in BWRVIP-74-A. The projected USE for the beltline welds is acceptable for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(ii) – Reactor vessel upper shelf energy TLAAs have been projected to the end of the period of extended operation.

Table 4.2-2
USE Projections for 54 EFPY

Sub-Component(1)	I.D. No.	Heat (Single/Tandem wire)	% Cu	Initial USE	¼T Fluence n/cm^2	Drop in USE	¼T USE (ft-lb)
PLATES:							
Lower-Intermediate Shell (Course #2)	Mk 22-1-1	B5301-1	0.13	98	8.10E+17	12.1%	86.1
WELDS:							
Lower Vertical (Axial/Longitudinal)	BA-BD	3P4966 (S)	0.025	98	2.71E+17	7.0%	91.1
		3P4966 (T)	0.025	98	2.71E+17	7.0%	91.1
Lower-Intermediate Vertical (Axial/Longitudinal)	BE-BH	3P4966 (S)	0.025	98	8.10E+17	9.1%	89.1
		3P4966 (T)	0.025	98	8.10E+17	9.1%	89.1
Lower to Lower-Intermediate Girth (Circumferential)	AB	5P6756 (S)	0.080	91	3.30E+17	9.8%	82.1
		5P6756 (T)	0.080	97	3.30E+17	9.8%	87.5
	AB	3P4955 (S)	0.027	90	3.30E+17	7.4%	83.3
		3P4955 (T)	0.027	95	3.30E+17	7.4%	87.9

(1) The sub-components not on this table have no projection due to the initial USE being unknown. See Table 4.2-3 and Table 4.2-4 for the equivalent margin analyses for the limiting plate and weld.

Table 4.2-3
RPV Beltline Plate USE Equivalent Margin Analysis for 54 EFPY

Surveillance Plate USE (Heat: B5301-1)		
% Cu	=	0.13
Unirradiated USE	=	98.0 ft-lb
1st Capsule Measured USE	=	99.6 ft-lb
1st Capsule Fluence	=	1.55E+17 n/cm^2
1st Capsule Measured Decrease	=	-1.6 %
1st Capsule RG 1.99 Predicted Decrease	=	8.0 %
Limiting Beltline Plate USE (Heat: C1337-1 and C1337-2)		
% Cu	=	0.15
54 EFPY ¼T Fluence	=	8.10E+17 n/cm^2
RG 1.99 Predicted Decrease	=	13.2 %
Adjusted Decrease	=	N/A
13.2 %	≤	23.5 % (bounding value from SER for BWRVIP-74-A)
Therefore, the vessel plates are bounded by Equivalent Margin Analysis in BWRVIP-74-A.		

Table 4.2-4
RPV Beltline Weld USE Equivalent Margin Analysis for 54 EFPY

Surveillance Weld USE (Heat 3P4966):		
% Cu	=	0.03
Unirradiated USE	=	98.0 ft-lb
1st Capsule Measured USE	=	108.0 ft-lb
1st Capsule Fluence	=	1.55E+17 n/cm^2
1st Capsule Measured Decrease	=	-10.2 %
1st Capsule RG 1.99 Predicted Decrease	=	6.0 %
ISP Surveillance Weld USE (Heat 5P6756):		
% Cu	=	0.06
Unirradiated USE	=	104.4 ft-lb
River Bend 183º Capsule Measured USE	=	84.4 ft-lb
River Bend 183º Capsule Fluence	=	1.16E+18 n/cm^2
SSP Capsule F Measured USE	=	79.3 ft-lb
SSP Capsule F Fluence	=	1.94E+18 n/cm^2
SSP Capsule H Measured USE	=	84.6 ft-lb
SSP Capsule H Fluence	=	1.36E+18 n/cm^2
River Bend 183º Capsule Measured Decrease	=	19.2 %
River Bend 183º Capsule RG 1.99 Predicted Decrease	=	12.5 %
SSP Capsule F Measured Decrease	=	24.0 %
SSP Capsule F RG 1.99 Predicted Decrease	=	14.0 %
SSP Capsule H Measured Decrease	=	19.0 %
SSP Capsule H RG 1.99 Predicted Decrease	=	13.0 %
Limiting Beltline Weld USE (Heat 624039/D205A27A):		
% Cu	=	0.10
54 EFPY ¼T Fluence	=	8.10E+17 n/cm^2
RG 1.99 Predicted Decrease	=	13.2 %
Adjusted Decrease	=	21.6 % (1)
21.6 % (54 EFPY)	≤	39.0 % (bounding value from SER for BWRVIP-74-A)
Therefore, the vessel welds are bounded by this Equivalent Margin Analysis.		

(1) The 54 EFPY adjusted decrease was evaluated for license renewal using the formulas for the curves in Figures 1 and 2 of RG 1.99, rather than by reading values off the curves. This resulted in a larger adjustment based on surveillance data than was used for the 33.1 EFPY projections.

4.2.3 Adjusted Reference Temperature Analysis

In addition to USE, the other key parameter that characterizes the fracture toughness of a material is the RT_{NDT}. This reference temperature changes as a function of exposure to neutron radiation resulting in an adjusted reference temperature, ART.

The initial RT_{NDT} is the reference temperature for the unirradiated material as defined in Paragraph NB-2331 of Section III of the ASME Boiler and Pressure Vessel Code. The change due to neutron radiation is referred to as ΔRT_{NDT}.

The ART is calculated by adding the initial RT_{NDT}, the ΔRT_{NDT}, and a margin to account for uncertainties as prescribed in Regulatory Guide 1.99, Revision 2.

The ART evaluations of record for the vessel beltline plates and welds for the currently licensed period (33.1 EFPY), including power uprate conditions, are provided in NEDO-33144 (Reference 4.8-5). NEDO-33144 lists the initial RT_{NDT} and chemistry values for the Columbia reactor vessel materials obtained from the Columbia vessel Certified Material Test Reports. Some chemistry factors were adjusted when Surveillance Capsule Data and Integrated Surveillance Program (ISP) best estimates were available, as described in NEDO-33144.

The results and methodology in NEDO-33144, Revision 2 of Regulatory Guide 1.99 (Reference 4.8-6), and the projected fluence values listed in Table 4.2-1 were used to project the ART for 54 EFPY. The results of this projection are summarized in Table 4.2-5 for vessel beltline plates and welds. The ART values projected to 54 EFPY are used to develop P-T limit curves, as discussed in Section 4.2.4. Projected ART values are well below the 200°F end of life ART suggested in Section 3 of Regulatory Guide 1.99 and are, thus, acceptable for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(ii) – Reactor vessel adjusted reference temperature TLAAs have been projected to the end of the period of extended operation.

Table 4.2-5
ART Values for 54 EFPY

Sub-Component [1]	Heat or Heat/Lot [1]	% Cu	% Ni	Chemistry Factor	Initial RT_{NDT} ºF	¼T Fluence n/cm^2	ΔRT_{NDT} ºF	σ_1	σ_Δ	Margin ºF	ART ºF
PLATES :											
Lower Shell (Course #1)	C1272-1	0.15	0.60	110	28	2.71E+17	22.8	0	11.4	22.8	73.6
	C1273-1	0.14	0.60	100	20	2.71E+17	20.7	0	10.4	20.7	61.4
	C1273-2	0.14	0.60	100	4	2.71E+17	20.7	0	10.4	20.7	45.4
	C1272-2	0.15	0.60	110	0	2.71E+17	22.8	0	11.4	22.8	45.6
Lower-Intermediate Shell (Course #2)	B5301-1 [2]	0.13	0.50	88	-20	8.10E+17	33.1	0	16.5	33.1	46.2
	C1336-1	0.13	0.50	88	-8	8.10E+17	33.1	0	16.5	33.1	58.2
	C1337-1	0.15	0.51	105	-20	8.10E+17	39.5	0	17.0	34.0	53.5
	C1337-2	0.15	0.51	105	-20	8.10E+17	39.5	0	17.0	34.0	53.5
NOZZLES:											
N6 (RHR / LPCI)	Q2Q55W 790S	0.11	0.76	76.4	-20	4.48E+17	21.1	1.4	10.5	21.1	22.2

Table 4.2-5 (continued)
ART Values for 54 EFPY

Sub-Component [1]	Heat or Heat/Lot [1]	% Cu	% Ni	Chemistry Factor	Initial RT_{NDT} °F	¼T Fluence n/cm²	ΔRT_{NDT} °F	σ_1	σ_Δ	Margin °F	ART °F
WELDS:											
Lower Vertical (Axial/Longitudinal)	04P046 / D217A27A	0.06	0.9	82	-48	2.71E+17	17.0	0	8.5	17.0	-14.0
	07L669 / K004A27A	0.03	1.02	41	-50	2.71E+17	8.5	0	4.2	8.5	-33.0
	3P4966/ 1214-3482 (S) 3P4966 / 1214-3482 (T)	0.025	0.913	34	-30 -48	2.71E+17	7.0	0	3.5	7.0	-15.9 -33.9
	C3L46C / J020A27A	0.02	0.87	27	-20	2.71E+17	5.6	0	2.8	5.6	-8.8
	08M365 / G128A27A	0.02	1.10	27	-48	2.71E+17	5.6	0	2.8	5.6	-36.8
	09L853 / A111A27A	0.03	0.86	41	-50	2.71E+17	8.5	0	4.2	8.5	-33.0
Lower-Intermediate Vertical (Axial/Longitudinal)	3P4966 / 1214-3481 (S) 3P4966 / 1214-3481 (T)	0.025	0.913	34	-20 -6	8.10E+17	12.8	0	6.4	12.8	5.6 19.7
	04P046 / D217A27A	0.06	0.90	82	-48	8.10E+17	30.8	0	15.4	30.8	13.7
	05P018 / D211A27A	0.09	0.90	122	-38	8.10E+17	45.9	0	22.9	45.9	53.8
	624063 / C228A27A	0.03	1.00	41	-50	8.10E+17	15.4	0	7.7	15.4	-19.2
	624039 / D224A27A	0.07	1.01	95	-36	8.10E+17	35.7	0	17.9	35.7	35.5
	624039 / D205A27A	0.10	0.92	134	-50	8.10E+17	50.4	0	25.2	50.4	50.8
Lower to Lower-Intermediate Girth (Circumferential)	492L4871 / A422B27AF	0.03	0.98	41	-50	3.30E+17	9.5	0	4.8	9.5	-31.0
	04T931 / A423B27AG	0.03	1.00	41	-50	3.30E+17	9.5	0	4.8	9.5	-31.0
	5P6756 / 0342-3477	0.08	0.936	153.97[2]	-50	3.30E+17	35.7	0	17.9	35.7	21.4
	3P4955 / 0342-3443 (S) 3P4955 / 0342-3443 (T)	0.027	0.921	37	-16 -20	3.30E+17	8.6	0	4.3	8.6	1.2 -2.8

(1) For weld materials, (S) = Single Wire, (T) = Tandem Wire.

(2) Adjusted chemistry factor determined per NEDO-33144, Section 4.2.1.1 (Reference 4.8-5), which was approved by the NRC in an SER (Reference 4.8-2), and updated per Columbia specific Integrated Surveillance Program (ISP) data.

4.2.4 Pressure-Temperature Limits

To ensure that adequate margins of safety are maintained for various modes of reactor operation, 10 CFR 50, Appendix G specifies pressure and temperature requirements for affected materials for the service life of the reactor vessel. The basis for these fracture toughness requirements is ASME Section XI, Appendix G. The ASME Code requires P-T limits be established for hydrostatic pressure tests and leak tests; for operation with the core not critical during heatup and cooldown; and for core critical operation.

The Columbia P-T limit curves were revised in 2005 to include the effects of power uprate to 3486 MWt (Reference 4.8-2). The P-T limits are valid for 33.1 EFPY through the end of the currently licensed period. P-T limits for the period of extended operation will be calculated using the most accurate fluence projections available at the time of the recalculation. The projections may be adjusted if there are changes in core design or if additional surveillance capsule results show the need for an adjustment. The projected ART for the period of extended operation, see Section 4.2.3 above, gives confidence that future P-T curves will provide adequate operating margin.

License amendment requests to revise the P-T limits will be submitted to the NRC for approval, when necessary to comply with 10 CFR 50 Appendix G, as part of the Reactor Vessel Surveillance Program.

Disposition: 10 CFR 54.21(c)(1)(iii) – Reactor vessel pressure-temperature limits will be adequately managed for the period of extended operation as part of the Reactor Vessel Surveillance Program.

4.2.5 Reactor Vessel Circumferential Weld Inspection Relief

BWRVIP-74-A (Reference 4.8-7) reiterated the recommendation of BWRVIP-05 (Reference 4.8-8) that RPV circumferential welds could be exempted from examination. The NRC safety evaluation report (SER) for BWRVIP-74 agreed, but required that plants apply for this relief request individually. The relief request should demonstrate that at the expiration of the current license, the circumferential welds satisfy the limiting conditional failure probability for circumferential welds in the (BWRVIP-05) evaluation. This evaluation of circumferential weld mean adjusted reference temperature is a TLAA.

Energy Northwest analysis of the conditional probability of failure for the Columbia RPV circumferential welds is consistent with the position in BWRVIP-05 and NRC Generic Letter 98-05. The NRC concluded that the conditional probability of failure for the Columbia RPV circumferential welds was sufficiently low to justify elimination of the volumetric examinations through 33.1 EFPY (Reference 4.8-9).

Table 4.2-6 shows that the Columbia reactor pressure vessel circumferential (girth) weld parameters at 54 EFPY will remain within the NRC's (64 EFPY) bounding vessel parameters from the BWRVIP-05 SER. As such, the conditional probability of failure for circumferential welds remains below that stated in the NRC's Final Safety Evaluation of BWRVIP-05.

Disposition: 10 CFR 54.21(c)(1)(ii) – Reactor vessel circumferential weld TLAAs have been projected to the end of the period of extended operation.

Table 4.2-6
Circumferential Weld Parameters at 54 EFPY

Parameter Description	Columbia's Limiting Weld Wire (5P6756) 54 EFPY	NRC Limiting Plant Specific Analyses Parameters at 64 EFPY
Weld Copper content, %	0.08	0.10
Weld Nickel Content, %	0.936	0.99
Weld Chemistry Factor, ºF	153.97	134.9
End-of-life RPV inside diameter neutron fluence , n/cm^2	4.78E+17	1.02E+19
Initial (unirradiated) reference temperature (RT_{NDT}), ºF	-50	-65
Increase in reference temperature due to irradiation (ΔRT_{NDT}), ºF	44.0	135.6
Mean adjusted reference temperature (Mean ART = RT_{NDT} + ΔRT_{NDT}), ºF	-6.0	70.6

4.2.6 Reactor Vessel Axial Weld Failure Probability

The NRC SER for BWRVIP-74-A (Reference 4.8-7) evaluated the failure frequency of axially oriented welds in BWR reactor vessels and determined that this failure frequency is below 5.0E-06 per reactor year for 40 years of reactor operation. Applicants for license renewal must evaluate axially oriented RPV welds to show that their failure frequency remains below the 5.0E-06 value calculated in the BWRVIP-74 SER. The SER states that an acceptable way to do this is to show that the mean RT_{NDT} of the limiting axial beltline weld at the end of the period of extended operation is less than the values specified in the SER. The mean RT_{NDT} value from Table 1 of the SER for BWRVIP-74 that corresponds to a failure frequency of 5.0E-6 (for Pilgrim, a BWR/3) is 114ºF. This 114 °F is below the 117 °F determined in Table 2.6-5 of the SER for BWRVIP-05 (Reference 4.8-15) for Chicago Bridge & Iron vessels (similar to the

Columbia RPV). Columbia will compare to the more limiting value from the SER for BWRVIP-74.

Table 4.2-7 shows that the Columbia limiting axial weld mean RT_{NDT} at 54 EFPY is only 16.9 °F. The Columbia axial weld mean RT_{NDT} remains well below the 114 ºF from the SER for BWRVIP-74, thus the Columbia axial weld failure frequency is well below the acceptable limit of 5.0E-6.

Disposition: 10 CFR 54.21(c)(1)(ii) – Reactor vessel axial weld TLAAs have been projected to the end of the period of extended operation.

Table 4.2-7
Axial Weld Parameters at 54 EFPY

Parameter Description	Columbia's Bounding Axial Weld Heat/Lot 05P018/D211A27A
Weld Copper content, %	0.09
Weld Nickel Content, %	0.90
Weld Chemistry Factor, ºF	122
RPV inside diameter neutron fluence , n/cm^2	1.17E+18
Initial (unirradiated) reference temperature (RT_{NDT}), ºF	-38
Increase in reference temperature due to irradiation (ΔRT_{NDT}), ºF	54.9
Mean adjusted reference temperature (Mean ART = RT_{NDT} + ΔRT_{NDT}), ºF	16.9

[This page intentionally blank]

4.3 METAL FATIGUE

Fatigue evaluations for mechanical components are identified as TLAAs; therefore, the effects of fatigue must be addressed for license renewal. Fatigue is an age-related degradation mechanism caused by cyclic duty on a component by either mechanical or thermal loads.

The primary code governing design and construction of the systems, structures, and components (SSCs) of interest is the ASME Boiler and Pressure Vessel Code. The ASME Code requires evaluation of transient thermal and mechanical load cycles for Class 1 components. Design cycles and fatigue usage for Columbia are provided in stress reports for the Class 1 components and summarized in FSAR Section 3.9 and FSAR Table 3.9-1.

Class 1 SSCs include the reactor pressure vessel and reactor coolant pressure boundary components. Evaluation of fatigue for the reactor vessel is provided in Section 4.3.1. Fatigue of the non-Class 1 reactor vessel internals is addressed in Section 4.3.2. Fatigue of Class 1 reactor coolant pressure boundary piping and piping components is addressed in Section 4.3.3.

Calculation of fatigue usage values is not required for non-Class 1 SSCs. Instead, stress intensification factors and lower stress allowables are used to ensure components are adequately designed for fatigue.

Certain components of the Primary Containment were evaluated for fatigue. Results of evaluations are provided in Section 4.6.

The evaluation of reactor coolant environmental effects on fatigue of plant components is provided in Section 4.3.5.

The design cycles for Columbia are summarized in FSAR Section 3.9 and FSAR Table 3.9-1. FSAR Table 3.9-1 is reproduced as Table 4.3-1. Columbia counts all fatigue significant cycles, not only for the design transients listed in FSAR Table 3.9-1 but also for the analysis of other plant components. The events listed in FSAR Table 3.9-1 have been evaluated and in some cases regrouped for easier counting. Faulted conditions listed in the FSAR are not used in the fatigue analyses and are not counted. Additional transients determined to be fatigue significant after the original design have been added to the counting procedure, while FSAR Table 3.9-1 lists the original design cycles. The projected number of occurrences of design transients to 60 years, as shown in Table 4.3-2, determined that some analyzed numbers of transients may be exceeded. These projections were done using linear extrapolation from the beginning of plant life. Recent operating experience suggests lower projections and as additional operating data is accumulated, subsequent projections will refine the number of cycles expected in 60 years. The last column of Table 4.3-2 lists the number of cycles that will be used for any future fatigue analyses (including the environmental fatigue analysis discussed Section 4.3.5). Columbia manages fatigue using the Fatigue Monitoring Program to track transient cycles and require corrective action before any analyzed number of cycles is reached.

Table 4.3-1
Plant Events (FSAR Table 3.9-1)

Conditions	Number of Cycles
Normal, upset, and testing	
Bolt up/unbolt [a, b]	123
Design pressure hydrostatic test [b]	130
Startup (100 °F/hr heatup rate) [b, c, f]	117
Daily reduction to 75 % power [a]	10,000
Weekly reduction to 50 % power [a]	2,000
Control rod pattern change [a]	400
Loss of feedwater heaters (80 cycles total) [b]	80
Operating basis earthquake event at rated operating conditions	10/50 [d]
Scrams	
Turbine generator trip, feedwater on, isolation valves stay open [b]	40
Other scrams [b]	140
Loss of feedwater pumps, isolation valves closed [b]	10
Single safety or relief valve blowdown [b, f]	8
Reduction to 0 % power, hot standby, shutdown (100 °F/hr cooldown rate) [b, c, f]	111
High-pressure core spray operation (10), standby liquid control operation (10), low-pressure core spray operation (10), and low-pressure coolant injection operation (10) [b]	40
Emergency	
Scrams	
Reactor overpressure with delayed scram feedwater stays on, isolation valves stay open [f]	1 [e]
Automatic blowdown	1 [e]
Improper start of cold recirculation loop	1 [e]
Sudden start of pump in cold recirculation loop	1 [e]
Improper startup with reactor drain shutoff followed by turbine roll and increase to rated power	1 [e]
Faulted	
Pipe rupture	1 [e]
Safe shutdown earthquake at rated operating conditions	1 [e]
ASME hydrostatic test	
1.25 x design pressure hydrostatic test ASME Section III, NB-6222 and NB-3114, allows up to 10 of these tests without stress calculation	No additional

Notes:
[a] Applies to reactor pressure vessel only.
[b] Thermal cycles are tracked for indication of reactor cumulative fatigue usage.
[c] Bulk average vessel coolant temperature change in any 1-hr period.
[d] Includes 50 peak operating basis earthquake (OBE) cycles for NSSS piping and 10 peak OBE cycles for other NSSS equipment and components. Fifty peak OBE cycles are postulated for all BOP piping and components.
[e] The annual encounter probability of the one-cycle events is 10^{-2} for emergency and 10^{-4} for faulted events.

f Columbia is analyzed for 120 startups and shutdowns. The 120 startups consist of 117 normal startups and 3 natural circulation startups. The 120 shutdowns consist of 111 normal shutdowns, 8 single safety or relief valve blowdowns, and 1 rapid depressurization with delayed trip.

Table 4.3-2
Actual Cycles and Projected Cycles

Conditions	Analyzed cycles	Actual cycles 12/13/1984 through 7/31/2007	60 year (12/13/2044) projection(3)	Cycles for future analyses(4)
Boltup/Unbolt	123	21	55	60
Reactor Startup (100 degF/hr)	120	88	233	250
Reactor Shutdown (100 degF/hr)	111	87	230	242
Vessel Pressure Tests	130	2(1, 2)	2(1)	60
Loss of Feedwater Heaters	80	0	0	80
Scram - Loss of feedwater pumps, isolation valves closed	10	7	18	20
Scram - Single safety relief valve blowdown	8	0	0	8
Scram - TG trip, FW on, isolation valves open	40	22	58	60
Scram - Other	140	34	90	90
LPCS operation	10	0	0	10
HPCS operation	10	4	10	10[4]
LPCI operation	10	0	0	10
SLC operation	10	0	0	10

(1) Vessel hydrostatic pressure tests are no longer performed. Vessel operational leak tests have replaced the hydrostatic pressure tests.
(2) These two pressure tests were hydrostatic pressure tests.
(3) Projections were not changed for those events that have not occurred.
(4) The 20 Scrams with Loss of Feedwater assume 3 HPCS injections per scram. The HPCS initiation assumes 10 additional injections without a scram. The HPCS nozzle is analyzed for 70 cycles combined from the two events.

4.3.1 Reactor Pressure Vessel Fatigue Analyses

The reactor vessel assembly consists of the pressure vessel, the vessel support skirt, the shroud support, nozzles, penetrations, stub tubes, head closure flanges, head closure studs, refueling bellows support, and stabilizer brackets.

The materials, fabrication procedures, and testing methods used in the construction of the reactor pressure vessel meet the requirements of ASME Section III, Class 1 vessels. Codes and standards, design criteria, and specification definitions for reactor vessel assembly structures and components are provided in FSAR Section 5.3.

Design cumulative usage factors for the limiting RPV assembly locations based on the original analyzed values obtained from design reports are summarized in Table 4.3-3. These cumulative usage factors (CUFs) were calculated based on the design transients listed in Table 4.3-2.

The projected number of occurrences of design transients to 60 years, as shown in Table 4.3-2, determined that some analyzed numbers of transients may be exceeded. These projections were done using linear extrapolation from the beginning of plant life. Recent operating experience suggests lower projections and as additional operating data is accumulated, subsequent projections will refine the number of cycles expected in 60 years. Columbia manages fatigue using the Fatigue Monitoring Program to track transient cycles and require corrective action before any analyzed number of cycles is reached.

Disposition: **10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended functions of the RPV will be adequately managed for the period of extended operation by the Fatigue Monitoring Program.**

Table 4.3-3
Fatigue Usage for Reactor Vessel Locations

Location:	CUF of Record	Location:	CUF of Record
Base plate	0.003	MS nozzle shell	0.470
Core DP nozzle stub tube	0.125	Refueling bellows support	0.453
Core spray nozzle forging	0.018	RHR/LPCI nozzle forging	0.116
Core spray nozzle safe end	0.801	RHR/LPCI safe end	0.157
Core spray nozzle sleeve	0.005	RHR/LPCI safe end ext.	0.189
Core spray nozzle stub	0.187	RHR/LPCI thermal sleeve	0.430
CRD housing	0.196	RRC inlet nozzle forging	0.22
CRD return nozzle safe end	0.543	RRC inlet nozzle safe end	0.214
CRD return nozzle forging	0.330	RRC inlet nozzle thermal sleeve	0.0013
CRD stub tube	0.083	RRC outlet nozzle clad	0.005
Drain nozzle	NA	RRC outlet nozzle forging	0.24
FW nozzle forging	0.000	RRC outlet nozzle safe end	0.005
FW nozzle safe end	0.696	Shroud support - Inconel	0.399
FW nozzle thermal sleeve	0.013	Shroud support – low-alloy steel	0.102
FW nozzle-shell junction	0.650	Stabilizer bracket	0.678
Instrument Nozzles (N12, N13, N14)	NA	Steam dryer brackets	0.064
Jet pump instrumentation nozzle (N9)	NA	Support skirt	0.064
MS nozzle forging	0.340	Top head flange	0.855
MS nozzle safe end	0.030	Vessel head spray nozzle	0.249
		Vessel studs	0.985

4.3.2 Reactor Vessel Internals

This section includes fatigue analyses of the overall reactor vessel internals performed as part of the plant design, as well as fatigue analyses of jet pumps performed in response to operating conditions.

4.3.2.1 Internals Fatigue Analyses

The RPV internals are described in terms of two assemblies: Core Support Structures and Reactor Internals. Core Support Structures include the shroud, shroud support (included as part of the reactor vessel for fatigue), core plate with wedges and hold-down bolts, top guide, fuel supports, and control rod guide tubes. Reactor internals include the jet pump assemblies, jet pump instrumentation, feedwater spargers, vessel head spray line, differential pressure line, incore flux monitor guide tubes, initial startup neutron sources (removed), surveillance sample holders, core spray lines (in-vessel) and spargers, incore instrument housings, LPCI coupling, steam dryer, shroud head and steam separator assembly, guide rods, and control rod drive (CRD) thermal sleeves.

Design cumulative usage factors for the limiting reactor vessel internals locations are obtained from design reports and are summarized in Table 4.3-4. These CUFs were calculated based on the design transients listed in Table 4.3-2.

The projected number of occurrences of design transients to 60 years, as shown in Table 4.3-2, determined that some analyzed numbers of transients may be exceeded. These projections were done using linear extrapolation from the beginning of plant life. Recent operating experience suggests lower projections and as additional operating data is accumulated, subsequent projections will refine the number of cycles expected in 60 years. Columbia manages fatigue using the Fatigue Monitoring Program to track transient cycles and require corrective action before any analyzed number of cycles is reached.

Disposition: **10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended functions of the reactor vessel internals will be adequately managed for the period of extended operation by the Fatigue Monitoring Program.**

Table 4.3-4
CUFs for Reactor Vessel Internals

Location	**CUF**
Core spray sparger	0.20
Core spray piping	0.0598
Shroud (top guide wedge to shroud junction)	0.316
Shroud head bolt	0.047
Top guide (longest beam)	0.1625
CRD indicator tube	0.093
CRD outer tube	0.41
CRD cylinder	0.08
CRD index tube	0
CRD piston tube	0.3
CRD pressure housing	0.003
Incore guide tube	<1
Core Δp / LC	<0.01
Core plate	0.005
LPCI coupling	0.004
Jet pump riser brace	0.920[1]
Vessel head spray line assembly	0.640

(1) The jet pump riser brace was analyzed in significant detail in response to an operating event at Columbia. This CUF contains usage for 1.5 times the design cycles shown in Table 4.3-2 plus operation at unbalanced flow plus the remainder of 60 years at balanced flow. See Section 4.3.2.2 for details.

4.3.2.2 Jet Pump Fatigue Analyses

In August 2000, Columbia operated for a period of time with the recirculation pumps in an unbalanced mode (pump speeds different by more than 50 percent). The effect of that flow imbalance on the fatigue usage of the jet pumps was an additional 0.0035.

Inspections during the Spring 2001 outage (R-15) identified gaps in the jet pump set screws. To justify operation through cycle 16, a fatigue analysis of the jet pumps was done. The original fatigue a usage factor for all jet pumps was 0.50 due to the design cycles. The additional usage due to the gaps is 0.119 for jet pumps 1 and 6 (risers 1/2 and 5/6) plus a usage of 0.001 for the unbalanced flow event. This gives a cumulative usage factor of 0.620 for risers 1/2 and 5/6 while retaining the original 0.50 for the other eight risers.

Jet pump clamps were installed on all 20 jet pumps during R-17 (2005). Each jet pump mixer was clamped to its diffuser to minimize flow induced vibration caused by leakage at the mixer to diffuser slip joint interface. As long as the set screw gaps remain within their revised criteria, no additional fatigue due to bypass leakage flow induced vibration is accumulated. These clamps greatly reduced the future potential for riser brace fatigue.

The latest gap status was reviewed after the 2007 outage. The usage factors were extended to 60 years by assuming the usage due to design cycles would increase from 0.5 to 0.75. Further assuming no subsequent unbalanced flow operation and no subsequent operation with gaps, results in a cumulative usage factor of 0.87 (0.75 + 0.119 + 0.001) for risers 1/2 and 5/6 and 0.75 for the other eight risers. The maximum 60-year CUF of any jet pump riser has been conservatively projected at 0.920.

The projected number of occurrences of design transients to 60 years, as shown in Table 4.3-2, determined that some analyzed numbers of transients may be exceeded. These projections were done using linear extrapolation from the beginning of plant life. Recent operating experience suggests lower projections and as additional operating data is accumulated, subsequent projections will refine the number of cycles expected in 60 years. Columbia manages fatigue using the Fatigue Monitoring Program to track transient cycles and require corrective action before any analyzed number of cycles is reached. The Fatigue Monitoring Program will also monitor the occurrence of design cycles and will monitor the jet pump gaps, effectively managing the fatigue of the jet pumps through the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(iii) - The effects of aging on the intended functions of the jet pumps will be adequately managed for the period of extended operation by the Fatigue Monitoring Program.

4.3.3 Reactor Coolant Pressure Boundary Piping and Piping Component Fatigue Analyses

Fatigue analyses of Class 1 piping are based on the transients found in the Columbia Piping Specification that are in turn based on the design transients listed in FSAR Section 3.9. The Class 1 boundary encompasses all reactor coolant pressure boundary piping (pipe and fittings) and in-line components subject to ASME Section XI, Subsection IWB, inspection requirements. FSAR Tables 3.2-1, 3.2-2, and 3.2-3 give codes and standards, design criteria, and specification definitions for Class 1 piping. These components are generally designed in compliance with ASME Section III, Subsection NB-3600 (NC-3600 for ≤1” piping).

FSAR Section 3.6.2 indicates that potential intermediate high energy line break locations can be eliminated based on CUFs being less than 0.1 if other stress criteria are also met. The usage factors, as calculated in the design fatigue analyses, account for the design transients assumed for the original 40-year life of the plant. Therefore, the determination of cumulative usage factors used in the selection of postulated high energy line break locations are TLAAs The Fatigue Monitoring Program will identify when the transients for piping systems are approaching their analyzed numbers of cycles. Prior to any transient exceeding its analyzed number of cycles for a piping system, the design calculations for that system will be reviewed to determine if any additional locations should be designated as postulated high energy line breaks, under the original criteria of FSAR Section 3.6. If other locations are determined to require consideration as postulated break locations, actions will be taken to address the new break locations.

During initial plant startup, an induction heating stress improvement (IHSI) process was used on various RPV nozzles to safe end and safe end to pipe welds. In the 1994 refueling outage, Columbia performed a mechanical stress improvement process (MSIP) for multiple RPV nozzles to safe end and safe end to pipe welds. No credit is taken for MSIP or IHSI in the calculation of CUFs for the Columbia vessel nozzles and safe ends.

All Class 1 piping was reviewed for the power uprate. The power uprate evaluation scaled existing fatigue analyses based on the changes in stress expected from the power uprate. This evaluation showed that there was adequate margin in each system to accommodate the power uprate (the increased CUF after the power uprate was approximated by the report). The maximum CUFs for Class 1 piping are shown in Table 4.3-5. The Fatigue Monitoring Program uses the systematic counting of plant transient cycles to ensure that component design fatigue usage limits are not exceeded. Design fatigue usage for 40 years of operation is provided in Table 4.3-5 for the limiting reactor coolant pressure boundary components.

A review of Columbia's documentation found several fatigue analyses for Class 1 valves that were TLAAs. The fatigue usage for those valves is based on transients that are tracked by the Fatigue Monitoring Program. The maximum CUFs for any Class 1 valves is 0.84 for the head spray inside containment check valve and 0.6599 for five 12 inch containment isolation valves. These CUFs are included in Table 4.3-5.

Metal fatigue for all Class 1 reactor coolant pressure boundary piping and in-line components (as listed in Table 4.3-5) is managed by the Fatigue Monitoring Program. The Fatigue Monitoring Program will identify when the transients for piping systems are approaching their analyzed numbers of cycles. Prior to any transient exceeding its analyzed number of cycles for a piping system, the design calculations for that system will be reviewed and appropriate actions will be taken.

Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended functions of the reactor coolant pressure boundary piping and components will be adequately managed for the period of extended operation by the Fatigue Monitoring Program.

Table 4.3-5
CUFs for Reactor Pressure Boundary Piping and Piping Components

System or Component	Max CUF
Reactor Feedwater Line A	0.250
Reactor Feedwater Line B	0.137
Reactor Feedwater / RWCU	0.588
Main Steam Line A	0.446
Main Steam Line B	0.7225
Main Steam Line C	0.222
Main Steam Line D	0.647
Main Steam Isolation Valves	0.0093
Reactor Recirculation Loop A	0.850
Reactor Recirculation Loop B	0.920
Reactor Recirculation Isolation Valves	0.0036
Reactor Water Cleanup	0.152
High Pressure Core Spray	0.237
Low Pressure Core Spray	0.145
Residual Heat Removal	0.001
Reactor Core Isolation Cooling	0.487
Reactor Vessel Head Spray	0.209
Reactor Vessel Head Vent to Main Steam	0.940
Reactor Vessel Level Instrument Lines and Condensing Pots	0.49
Standby Liquid Control System	0.262
Head spray check valve	0.84
12 inch containment isolation valves (5)	0.6599

4.3.4 Non-Class 1 Component Fatigue Analyses

The specific codes and standards to which SSCs were designed are listed in FSAR Table 3.2-1 and FSAR Table 3.2-2.

Non-class 1 components that are Quality Group B or C are designed and constructed to the ASME Boiler and Pressure Vessel Code. The design of ASME III Code Class 2 and 3 piping systems incorporates a cycle based stress range reduction factor for determining acceptability of piping design with respect to thermal stress range. Columbia SSCs designated as quality group D are designed to ANSI B31.1, which also incorporates stress range reduction factors based upon the number of thermal cycles. In general, a stress range reduction factor of 1.0 in the stress analyses applies for up to 7,000 thermal cycles. The allowable stress range is reduced by the stress range reduction factor if the number of thermal cycles exceeds 7,000. If fewer than 7,000 cycles are expected through the period of extended operation, then the fatigue analysis (stress range reduction factor) of record will remain valid through the period of extended operation.

The non-Class 1 aging management reviews for Columbia determined piping locations susceptible to fatigue. The fatigue evaluation of non-Class 1 components determined whether the associated operating temperature exceeded threshold values for the affected materials and, if so, evaluated the number of transient cycles expected. In every case, the number of projected cycles for 60 years was found to be less than 7,000 for piping and in-line components whose temperatures exceed threshold values. Therefore, fatigue for non-Class 1 piping and in-line components remains valid for the period of extended operation.

None of the non-Class 1 vessels, heat exchangers, storage tanks, or pumps were designed to ASME Section VIII, Division 2 or ASME Section III, Subsection NC-3200. Therefore, there is no fatigue TLAA for these components.

Disposition: 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the period of extended operation.

4.3.5 Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping

4.3.5.1 Background

The NRC requires applicants for license renewal to address the reactor coolant environmental effects on fatigue of plant components (NUREG-1800 Section 4.3). The minimum set of components for a BWR of Columbia's vintage is derived from NUREG/CR-6260 (Reference 4.8-10), as follows:

1. Reactor vessel shell and lower head
2. Reactor vessel feedwater nozzle
3. Reactor recirculation piping (including inlet and outlet nozzles)
4. Core spray line reactor vessel nozzle and associated Class 1 piping
5. Residual heat removal return line Class 1 piping
6. Feedwater line Class 1 piping

In NUREG-1800, the NRC mentions using the calculational approach whereby the fatigue life adjustment factor (F_{en}) is determined for each fatigue-sensitive component and applying those environmental fatigue correction factors to the component CUFs to verify acceptability of the components for the period of extended operation. In NUREG-1800, the NRC further points out equations for calculating F_{en} values as being those contained in NUREG/CR-6583 (Reference 4.8-11) for carbon steel and low alloy steel components and in NUREG/CR-5704 (Reference 4.8-12) for austenitic stainless steel components. Nickel alloy components were also analyzed using the stainless steel equations in NUREG/CR-5704.

Environmentally assisted fatigue (EAF) evaluations are not applied during the current licensing basis. EAF evaluations done for the period of extended operation apply the EAF correction factors per NUREG-6260.

4.3.5.2 Columbia Evaluation

Using projected cycles from the Fatigue Monitoring Program and methodology accepted by the NRC, as noted above, the limiting locations (a total of 14 component locations corresponding to the six NUREG/CR-6260 components) for the material for each component location were evaluated. None of the 14 locations evaluated have an environmentally adjusted CUF of greater than 1.0 (see Table 4.3-6).

Values for dissolved oxygen, before and after the adoption of Hydrogen Water Chemistry (HWC), were used in the F_{en} determination. The plant operated with Normal Water Chemistry (NWC) for 20.9 years from January 19, 1984 (initial startup) until November 28, 2004. The plant has operated with HWC from November 28, 2004, and is assumed to continue operating with HWC until January 13, 2044; a combined time of

39.1 years. The time Columbia has operated under both NWC (21 years) and HWC (39 years) conditions was considered in the estimation of an effective F_{en} based on a time weighted average of the HWC and NWC F_{en} values over 60 years of operation. The cumulative fatigue usage factor incorporating the effects of reactor coolant environment is obtained by multiplying the usage factor by F_{en}.

Original fatigue usage calculations were reviewed, and the transient groupings and load pairs used in those analyses were carried over to the EAF analyses. This ranged from a single transient grouping with a single load pair for the RRC inlet nozzle safe end to nearly a dozen load pairs and individual transients for the feedwater nozzle and RRC piping. For each load pair, a value of F_{en} was calculated. The environmentally adjusted usage factor for each load pair was then obtained by multiplying the usage factor by the F_{en} for that load pair. The environmentally adjusted cumulative usage factor for each location was obtained by summing the individual environmentally adjusted usage factors for each load pair.

The environmentally-adjusted CUFs for Columbia are shown in Table 4.3-6. The minimum F_{en} for any load pair, the maximum F_{en} for any load pair, and an “average F_{en}” for each location is given. The average F_{en} is simply the final environmentally assisted CUF divided by the non-environmentally assisted CUF.

Columbia will manage the aging effect of fatigue for the period of extended operation, with consideration of the environmental effects using the Fatigue Monitoring Program in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of environmentally-assisted fatigue will be adequately managed for the period of extended operation using the Fatigue Monitoring Program.

Table 4.3-6
CUFs for NUREG/CR-6260 Locations

NUREG/CR-6260 generic locations		Columbia plant-specific locations	Material type	Revised CUF in air (2)	Per NUREG/CR-5704 and NUREG/CR-6583			
					Min. F_{en} (3)	Average F_{en} (3)	Max. F_{en} (3)	Environmentally assisted CUF
1	Reactor vessel shell and lower head	CRD stub tube	Nickel Alloy	0.0125	12.90	12.90	12.90	0.162
1	Reactor vessel shell and lower head	CRD housing	SS	0.0007	12.90	12.90	12.90	0.0088
2	Reactor vessel feedwater nozzle	FW nozzle to shell junction (1)	LAS	0.132	3.04	6.72	20.52	0.887
2	Reactor vessel feedwater nozzle	FW nozzle safe end (1)	Nickel Alloy	0.00126	3.29	4.77	6.43	0.00601
3	Reactor recirculation piping (including inlet and outlet nozzles)	Reactor vessel RRC inlet nozzle safe end	SS	0.026	12.90	12.90	12.90	0.335
3	Reactor recirculation piping (including inlet and outlet nozzles)	Reactor vessel RRC outlet nozzle forging	LAS	0.054	10.51	10.51	10.51	0.567
3	Reactor recirculation piping (including inlet and outlet nozzles)	RRC piping	SS	0.373	2.55	2.66	12.90	0.994
4	Core spray line reactor vessel nozzle and associated Class 1 piping	Reactor vessel nozzle safe end – Core Spray	Nickel Alloy	0.241	2.55	3.95	3.96	0.953

Table 4.3-6 (continued)
CUFs for NUREG/CR-6260 Locations

NUREG/CR-6260 generic locations		Columbia plant-specific locations	Material type	Revised CUF in air (2)	Per NUREG/CR-5704 and NUREG/CR-6583			
					Min. F_{en} (3)	Average F_{en} (3)	Max. F_{en} (3)	Environmentally assisted CUF
4	Core spray line reactor vessel nozzle and associated Class 1 piping	LPCS piping	CS	0.155	1.74	5.22	7.33	0.809
4	Core spray line reactor vessel nozzle and associated Class 1 piping	HPCS piping	CS	0.321	1.74	2.25	2.49	0.723
5	Residual Heat Removal (RHR) nozzles and associated Class 1 piping	RHR/LPCI nozzle safe end	Nickel Alloy	0.139	2.55	6.16	6.94	0.856
5	Residual Heat Removal (RHR) nozzles and associated Class 1 piping	RHR/LPCI nozzle safe end extension	CS	0.190	1.74	2.39	2.75	0.455
5	Residual Heat Removal (RHR) nozzles and associated Class 1 piping	RHR/LPCI piping	CS	0.001	20.49	20.49	20.49	0.02
6	Feedwater line Class 1 piping	RFW/RWCU Tee (1)	CS	0.210	1.74	1.85	2.85	0.389

Note: CS is carbon steel, LAS is low alloy steel, SS is stainless steel

(1) Assumed NWC dissolved oxygen concentration equaled to 150 ppb for the RFW nozzle and RFW/RWCU Tee F_{en} calculation.

(2) CUF of record previously identified in Table 4.3-3 and Table 4.3-5.

(3) Effective F_{en} determined for each load pair based on a time weighted average for HWC and NWC for 60 years of operation. Average F_{en} is the reported environmentally assisted CUF divided by the non-environmentally assisted CUF.

4.4 ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT

Environmental qualification (EQ) analyses for those components with a qualified life of 40 years or greater are identified as TLAAs. NRC regulation 10 CFR 50.49 "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants" requires licensees to identify electrical equipment covered under this regulation and to maintain a qualification file demonstrating that the equipment is qualified for its application and will perform its safety function up to the end of its qualified life. The EQ Program implements the requirements of 10 CFR 50.49 and will be used to manage the effects of aging on the intended functions of the components associated with EQ TLAAs for the period of extended operation.

Review of Columbia EQ qualification information documents (QIDs) for electrical equipment concluded that the majority are TLAAs. There are 113 QIDs for equipment covered by 10 CFR 50.49. Of these, 100 are TLAAs because they meet all six of the criteria established in the TLAA definition of 10 CFR 54.3. The remaining 13 are not TLAAs because the subject equipment has a qualified life of less than 40 years.

The EQ TLAAs were evaluated per 10 CFR 54.21(c)(1). Any required update of the QIDs will be performed in accordance with the EQ Program requirements and processes. Update of the QIDs is not a license renewal commitment. The license renewal commitment is that the EQ Program will be used to manage aging of EQ components. Ultimately any needed updates of the QIDs to extend qualified life prior to entering the period of extended operation will be driven by the EQ Program, using the same methodology as in the current license term to ensure components do not exceed their qualified life. The updates may include re-analysis of the qualified life, refurbishment of the equipment, or replacement of the equipment. A re-analysis will be performed in a timely manner (that is, with sufficient time available to refurbish, replace, or re-qualify the component if the re-analysis is unsuccessful). The EQ Component Re-analysis Attributes (from NUREG-1800, Table 4.4-1) are addressed below.

EQ Component Re-analysis Attributes

The re-analysis of an aging evaluation is normally performed to extend the qualification of the component by reducing excess conservatism incorporated in the previous evaluation. Re-analysis of an aging evaluation to extend the qualification of a component is performed on a routine basis pursuant to 10 CFR 50.49(e) as part of the Columbia EQ Program. A component's life-limiting condition may be due to thermal, radiation, or cyclical aging; however, the majority of component aging limits are based on thermal conditions. Conservatism may exist in aging evaluation parameters, such as the assumed peak ambient temperature of the component, an unrealistically low activation energy, or in the specific application of a component (energized vs. de-energized). The re-analysis of an aging evaluation is documented according to Columbia quality assurance program requirements, which require the verification of assumptions and conclusions. As already noted, important attributes of a re-analysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if the acceptance criteria are not met). These attributes are discussed below.

Analytical Methods

The Columbia EQ Program uses the same analytical models in the re-analysis of an aging evaluation as those applied during the previous qualification analysis. The Arrhenius methodology is an acceptable thermal model for performing a thermal aging evaluation. The analytical method used for a radiation aging evaluation is to demonstrate qualification for the total integrated dose (that is, normal radiation dose for the projected installed life plus accident radiation dose). For license renewal, one acceptable method of establishing the 60-year normal radiation dose is to multiply the 40-year normal radiation dose by 1.5 (that is, 60 years divided by 40 years). The result is added to the accident radiation dose to obtain the total integrated dose for the component. For cyclical aging, an approach similar to that used for radiation dose may be used. Other models may be justified on a case-by-case basis.

Data Collection and Reduction Methods

Reducing excess conservatism in the component service conditions (for example, temperature, radiation, cycles) used in the previous aging evaluation is a method used for a re-analysis in the Columbia EQ Program. Temperature data used in an aging evaluation should be conservative and based on plant design temperatures or on actual plant temperature data. When used, plant temperature data can be obtained in several ways, including monitors used for technical specification compliance, other installed monitors, measurements made by plant operators during rounds, and temperature sensors installed on large motors (while the motor is not running). A representative number of temperature measurements are evaluated to establish the temperatures used in an aging evaluation. Plant temperature data may be used in an aging evaluation in different ways, such as: a) directly applying the plant temperature data in the evaluation, or b) using the plant temperature data to demonstrate conservatism when using plant design temperatures for an evaluation. Any changes to material activation energy values as part of a re-analysis must be justified. Similar methods of reducing excess conservatism in the component service conditions used in previous aging evaluations can be used for radiation and cyclical aging.

Underlying Assumptions

The Columbia EQ Program environmental qualification evaluations contain sufficient conservatism to account for most environmental changes occurring due to plant conditions and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the environment of a qualified component, the affected EQ component is evaluated, and appropriate corrective actions are taken, which may include changes to the qualification bases and conclusions.

Acceptance Criteria and Corrective Actions

Under the Columbia EQ Program, the re-analysis of an aging evaluation could extend the qualification of a component. If the qualification cannot be extended by re-analysis, the component must be refurbished, replaced, or re-qualified prior to exceeding the current qualified life. A re-analysis should be performed in a timely manner (such that sufficient time is available to refurbish, replace, or re-qualify the component if the re-analysis is unsuccessful).

Therefore, the EQ TLAAs are dispositioned per 10 CFR 54.21(c)(1)(iii). The Columbia EQ Program is part of the current licensing basis, is in compliance with 10 CFR 50.49, and is the basis for managing the aging of EQ equipment in the current license term.

In Section X.E1 of NUREG-1801, the NRC has already generically evaluated EQ programs put in place to meet 10 CFR 50.49 and found them acceptable for managing the aging of electrical EQ equipment during the period of extended operation. NUREG-1800, Section 4.4.2.1.3, states that if a licensee takes credit for this generic evaluation of the EQ Program, "…the applicant should indicate that the material referenced is applicable to the specific plant involved and should provide the information necessary to adopt the finding of program acceptability as described and evaluated in this report." To this end, a comparison of the EQ Program to the evaluation in NUREG-1801, Section X.E1 was performed with the results documented in Appendix B of this Application. From this review, it was concluded that the Columbia EQ Program contains the same program elements evaluated in NUREG-1801 and that the EQ Program is consistent with the generic evaluation performed by the NRC and documented in NUREG-1801. Continued effective implementation of the Columbia EQ Program assures that the aging effects will be adequately managed and that EQ components will continue to perform their intended functions for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended functions of the EQ components will be adequately managed for the period of extended operation by the EQ Program.

[This page intentionally blank]

4.5 CONCRETE CONTAINMENT TENDON PRESTRESS

Section 4.5 of NUREG-1800 addresses the issue of TLAAs associated with concrete containment tendon prestress. Columbia has a Mark II primary containment, and this structure does not contain pre-stressed tendons. Therefore, evaluations for tendon prestress are not applicable to Columbia.

Disposition: TLAAs for tendon prestress are not applicable to Columbia.

[This page intentionally blank]

4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENTS, AND PENETRATIONS FATIGUE ANALYSES

The Columbia Primary Containment utilizes a GE Mark II over-under pressure-suppression configuration. The drywell and suppression chamber (or wetwell) are large sealed volumes designed to contain and condense escaping reactor coolant. Both contain structures and piping systems with the suppression chamber approximately half filled with water (suppression pool) for steam quenching. The drywell is connected to the suppression pool by 99 downcomer pipes (3 of the 102 original pipes have been capped) that channel steam released during a LOCA for quenching and pressure suppression. (see FSAR Section 3A.3.2.1)

Codes and standards for the containment structure are given in FSAR Section 3.8.2.2 and FSAR Table 3.8-4. The cycles used in the fatigue evaluation of the containment components is given in FSAR Table 3A.4.1-3, which is reproduced below.

No operating basis earthquake has occurred through 2007, and thus are projected to remain within the 5 analyzed events through 60 years. The safe shutdown earthquake and post-LOCA chugging are once in a lifetime events and thus will not exceed the one analyzed event through 60 years of operation.

A review of plant data indicates that no more than 636 SRV cycles have occurred through 2007. This conservatively projects to 2,400 cycles through 60 years of operation, and remains well below the 13,434 cycles that have been analyzed. The fatigue analyses performed using these cycles will remain valid for the period of extended operation, as indicated by the table below.

FSAR Table 3A.4.1-3
Equivalent Stress Cycles for Fatigue Evaluation

Load	Number of Events	Number of Equivalent Stress Cycles per Event	Total Number of Stress Cycles
Operating basis earthquake	5	10	50
Safe shutdown earthquake	1	10	10
SRV [a]	4,478	3	13,434
Chugging	1	1,000	1,000

a This includes the cycles due to building motion, direct pressure, and fluid transients during SRV actuations.

As the cycles on which the containment fatigue analysis is based will not be exceeded for 60 years of operation, the analyses discussed in the following sections will remain valid for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(i) – The TLAAs associated with fatigue of the containment remain valid for the period of extended operation.

4.6.1 ASME Class MC Components

Class MC components include the primary containment vessel shell, large openings (equipment hatch, personnel hatches, and access hatch), penetrations (all except the large openings), and attachments (pipe supports in the wetwell, welding pads in the drywell, supports for the stabilizer truss, seal and shear lugs at the drywell floor, supports for the downcomer bracing system, pipe whip supports, radial beam supports, cap truss supports, catwalks, monorail, and platforms). The Class MC components were analyzed for fatigue using the transients listed in FSAR Table 3A.4.1-3, reproduced in Section 4.6 above. As these cycles will not be exceeded for 60 years of operation, the Class MC component fatigue analysis will remain valid for the period of extended operation.

A specific fatigue analysis was performed for the main steam penetrations. Main steam penetrations were analyzed using the transients listed in FSAR Table 3A.4.1-3, reproduced in Section 4.6 above. The maximum revised CUF was 0.174. As this CUF was calculated based on the cycles identified above, this analysis will remain valid for the period of extended operation.

In May 1995, the NRC staff granted Columbia an amendment to the operating license to allow an increase in the power level of the plant (Reference 4.8-13). For short-term containment pressure response, the peak pressure values are below design values and remain virtually unaffected by power uprate and extended load line limit. The loss-of-coolant accident (LOCA) containment dynamic loads are not affected by power uprate, and SRV containment loads will remain below their design allowables. (see FSAR Appendix 3A)

All events project to remain below the containment cyclic basis from FSAR Table 3A.4.1-3 for 60 years of operation as discussed in Section 4.6 above. Consequently, the analysis of the Class MC containment components remains valid for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(i) - The TLAAs for fatigue of the ASME Class MC components remain valid through the end of the period of extended operation.

4.6.2 Downcomers

There are 84 24-inch diameter downcomers and 18 28-inch downcomers. Three of the downcomers are capped (see FSAR Section 6.2.1.1.3.2).

The downcomer vent pipes are designed to contain and direct uncondensed drywell steam into the suppression pool following a pipe break accident. The upper portion of the downcomers are designed and constructed in accordance with ASME Section III Class 2 requirements while the lower portion are designed and constructed to ASME Section III Class 3 requirements. The only effect of this code break is to eliminate radiography requirements for the circumferential weld joining the upper and lower portions of the downcomers (see FSAR Section 3.8.3.4.9).

A fatigue evaluation of the downcomers was performed even though it is not an ASME Code requirement. The fatigue evaluation of the downcomer lines in the wetwell air volume was based on the number of cycles as presented in FSAR Table 3A.4.1-3 (reproduced in Section 4.6 above). The maximum fatigue usage factor for the 24-inch downcomers is 0.0346 and the maximum usage factor for the 28-inch downcomers is 0.0629. (see FSAR Table 3A.4.2-4 and Table 3A.4.2-5)

All events project to remain below the containment cyclic basis from FSAR Table 3A.4.1-3 for 60 years of operation as discussed in Section 4.6 above. Consequently, the analysis of the downcomers remains valid for the period of extended operation.

Disposition: **10 CFR 54.21(c)(1)(i) - The TLAA for fatigue of the downcomers remains valid through the end of the period of extended operation.**

4.6.3 Safety Relief Valve Discharge Piping

Each of the 18 SRVs on the main steam lines in the drywell chamber have a discharge line into the wetwell that terminates in a quencher in the suppression pool. To pass through the drywell floor, the discharge lines are routed through downcomers. (see FSAR Section 3A.3.1.1)

A fatigue evaluation of the SRV discharge piping was performed even though it is not an ASME Code requirement. The fatigue evaluation used the number of cycles as presented in FSAR Table 3A.4.1-3, reproduced in Section 4.6 above. The maximum fatigue usage factor for all 18 SRV discharge lines in the wetwell air volume was found to be 0.896, below ASME allowable limits of 1.0 (see FSAR Section 3A.4.2.4.6).

All events project to remain below the containment cyclic basis from FSAR Table 3A.4.1-3 for 60 years of operation as discussed in Section 4.6 above. Consequently, the analysis of the SRV discharge piping remains valid for the period of extended operation.

Disposition: **10 CFR 54.21(c)(1)(i) - The TLAA for fatigue of the SRV discharge piping remains valid through the end of the period of extended operation.**

4.6.4 Diaphragm Floor Seal

The diaphragm floor seal is located at the inside surface of the primary containment vessel periphery. It provides a flexible, pressure tight seal between the primary containment vessel and the diaphragm floor and is capable of accommodating differential thermal expansion between them.

The fatigue evaluation was performed using the cycles in Section 4.6 above. The maximum CUF is 0.7 per FSAR Table 3A.4.1-5. All events project to remain below the containment cyclic basis from FSAR Table 3A.4.1-3 for 60 years of operation as discussed in Section 4.6 above. Consequently, the analysis of the diaphragm floor seal remains valid for the period of extended operation.

Disposition: **10 CFR 54.21(c)(1)(i) - The TLAA for fatigue of the diaphragm floor seal remains valid through the end of the period of extended operation.**

4.6.5 ECCS Suction Strainers

The original Columbia ECCS suction strainers were replaced with a new strainer design constructed from cold-worked austenitic stainless steel. A linear elastic fracture mechanics analysis was performed to bound all the martensitic material in the suction strainer screens. A crack depth was assumed based on the depth of the Alpha Prime martensite in the strainer screen material.

Cyclic stresses were included in the crack growth analysis of the suction strainers. The fatigue crack evaluation determined that the assumed cracks will not propagate to a critical size for the remaining life of the plant. The maximum computed stress intensity value (K) was less than that required to cause cracking in Alpha martensite formed in austenitic stainless steel.

The stress value included direct pressure and inertial components from SRV actuation, OBE loads, and SRV steam chugging. (see FSAR Table 3A.4.1-3 as reproduced in Section 4.6 above.)

All events are projected to remain below the containment cyclic basis from FSAR Table 3A.4.1-3 for 60 years of operation as discussed in Section 4.6 above. Consequently, the analysis of the ECCS suction strainers remains valid for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(i) - The TLAA for crack growth of the ECCS suction strainers remains valid through the end of the period of extended operation.

[This page intentionally blank]

4.7 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

4.7.1 Reactor Vessel Shell Indications

Two indications in the reactor vessel shell were identified using ultrasonic testing methods during the 2005 inservice inspections. The indications were present in past inservice inspection examinations, but became rejectable under current ASME Section XI, IWB-3610 requirements. The rejected indications were evaluated and determined to be acceptable for continued service without repair, as reported to the NRC in Energy Northwest letter GO2-05-153 (Reference 4.8-14). The indications were evaluated per the guidelines of ASME Section XI, IWB-3610, which include acceptance criteria based on the applied stress intensity factors, using conservative assumptions in the applied stresses to determine the stress intensity factors for comparison to Code allowables.

This evaluation calculated a fatigue crack growth (0.0064 inches) at the end of 33.1 EFPY vessel service life that is insignificant in comparison to the bounding initial crack size of 0.39 inch. It also determined that the applied stress intensity factor (about 30 ksi√in) is well below the allowable K_{IC} of 63.25 ksi√in.

The calculation used two time-limited assumptions based on the 40-year life of the plant, and thus is a TLAA.

1. The ¼ T neutron fluence at weld BG (5.11E+17 n/cm^2 at 33.1 EFPY) was used for both welds. This fluence was used to calculate the material properties of the cracked area, and hence the crack propagation. As can be seen from Table 4.2-1, the projected ¼ T fluence for Weld BG at 54 EFPY is 8.10E+17 n/cm^2.
2. 500 significant thermal transients were assumed (SRV blowdown cycles being the worst case thermal cycle). From Table 4.3-2, it can be seen that no SRV blowdown cycles are expected through 60 years of operation; furthermore, only 409 significant thermal transients are expected (233 heatup/cooldowns, 166 scrams, and 10 HPCS actuations).

Although this calculation easily meets the acceptance criteria, it is based on a time-limited assumption of neutron fluence that will not remain valid for the period of extended operation. This indication is currently scheduled for re-inspection in 2015. Columbia will re-evaluate the indication based on the results of the 2015 inspection and either project this analysis through the period of extended operation or continue augmented inspections as required by the ASME code. As such, Columbia will manage the aging of the reactor vessel shell indications using the Inservice Inspection (ISI) Program for the period of extended operation.

Disposition: **10 CFR 54.21(c)(1)(iii) - Cracking of the reactor vessel shell near welds BG and BM will be adequately managed through the period of extended operation by the Inservice Inspection (ISI) Program.**

4.7.2 Sacrificial Shield Wall

The sacrificial shield wall (SSW) is discussed in FSAR Section 3.8.3.6, which states "It has been determined that in the 40-year life expectancy of the station, the outside face of the SSW will experience a neutron fluence of less than 2 x 10^{16} nvt." (For the discussion in this section, nvt is equivalent to n/cm^2 with neutron energy greater than 1 MeV).

Projected fluence at the SSW outer wall for 60 years of operation, including an increase in the neutron flux at the SSW of 5.28 percent due to power uprate, remains below 2 x 10^{16} nvt. As the estimated neutron fluence on the sacrificial shield wall is projected to remain below the FSAR value for 60 years, this TLAA has been projected through the period of extended operation.

Disposition: **10 CFR 54.21(c)(1)(ii) - The TLAA associated with the sacrificial shield wall fluence has been projected to the end of the period of extended operation.**

4.7.3 Main Steam Line Flow Restrictor Erosion Analyses

FSAR Section 5.4.4 indicates that a main steam line flow restrictor is provided for each of the four main steam lines. The restrictor is a complete assembly welded into the main steam line between the last main steam line SRV and the inboard main steam isolation valve (MSIV). The restrictor is designed to limit coolant flow rate from the reactor vessel (before the MSIVs are closed) to less than 200 percent of normal flow in the event a main steam line break occurs outside the containment. The restrictor assembly has no moving parts and consists of a venturi-type nozzle insert welded into the main steam line.

FSAR Section 5.4.4.4 indicates that only very slow erosion of the main steam flow restrictor is expected. Erosion of a flow restrictor is a safety concern since it could impair the ability of the flow restrictor to limit vessel blowdown following a main steam line break. Since erosion is a time-related phenomenon, the analysis for the effect it has on the flow restrictors over the life of the plant is a TLAA. Cast stainless steel (SA351, Type CF8) was selected for the steam flow restrictor material because it has excellent resistance to erosion-corrosion from high velocity steam.

Columbia has projected the erosion of the main steam flow restrictors for the period of extended operation. The projection concludes that after 60 years of erosion on the main steam flow restrictors, the choked flow will still be less than 200 percent of normal flow. Therefore, the main steam flow restrictors will continue to perform their intended function for the period of extended operation.

Disposition: **10 CFR 54.21(c)(1)(ii) - The TLAA for erosion of the main steam line flow restrictors has been projected to the end of the period of extended operation.**

[This page intentionally blank]

4.8 REFERENCES

4.8-1 GO2-04-107, Energy Northwest Letter to USNRC Document Control Desk, “License Amendment Request to Revise Technical Specification 3.4.11 Reactor Coolant System (RCS) Pressure and Temperature (P/T) Limits,” June 9, 2004 (includes excerpts from NEDO-33144).

4.8-2 GI2-05-076, NRC to J.V. Parrish (Energy Northwest), “Columbia Generating Station – Issuance of Amendment RE: Reactor Coolant System (RCS) Pressure and Temperature Limits,” May 12, 2005 (includes SER).

4.8-3 General Electric Report GE-NE-0000-0023-5057-R0, “Energy Northwest Columbia Generating Station Neutron Flux Evaluation,” April 2004 (GE Proprietary Information).

4.8-4 NRC letter, S. A. Richard, USNRC, to J. F. Klaproth, GE-NE, “Safety Evaluation for NEDC-32983P, General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluation (TAC No. MA9891)”, MFN 01-050, September 14, 2001.

4.8-5 General Electric Report NEDO-33144, “Pressure-Temperature Curves for Energy Northwest Columbia,” April 2004 (Non-proprietary version of NEDO-33144P).

4.8-6 NRC Regulatory Guide 1.99, Radiation Embrittlement of Reactor Vessel Materials, Revision 2.

4.8-7 BWRVIP-74-A: “BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal,” EPRI, Palo Alto, CA: 2003. 1008872. (EPRI Proprietary).

4.8-8 BWRVIP-05: “BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations,” EPRI, Palo Alto, CA. 1995. 105697. (EPRI Proprietary).

4.8-9 GI2-05-090, NRC to J.V. Parrish (Energy Northwest), “Safety Evaluation for Columbia Generating Station – Relief Request for Alternatives to Volumetric Examination of Reactor Pressure Vessel Circumferential Shell Welds in Accordance with BWRVIP-05 (TAC No. MC3916),” June 1, 2005.

4.8-10 NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components,” March 1995.

4.8-11 NUREG/CR-6583, “Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels,” March 1998.

4.8-12 NUREG/CR-5704, “Effects of LW Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels,” April 1999.

4.8-13 GI2-95-099, J. W. Clifford (NRC) to J. V. Parrish, “Issuance of Amendment for the Washington Public Power Supply System Nuclear Project No. w (TAC Nos. M87076 and M88625),” May 2, 1995.

4.8-14 GO2-05-153, W Oxenford (Energy Northwest) Letter to NRC Document Control Desk, “Columbia Generating Station, Docket No. 50-397 Analytical Evaluation of Inservice Inspection Examination Results,” September 15, 2005.

4.8-15 NRC letter, Gus C. Lainas to Carl Terry, BWRVIP Chairman, “Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report (TAC No. M93925),” July 28, 1998.

APPENDIX A

FINAL SAFETY ANALYSIS REPORT SUPPLEMENT

[This page intentionally blank]

APPENDIX A

TABLE OF CONTENTS

APPENDIX A

TABLE OF CONTENTS

APPENDIX A
TABLE OF CONTENTS

[This page intentionally blank]

A.0 FINAL SAFETY ANALYSIS REPORT SUPPLEMENT

A.1 INTRODUCTION

This appendix provides the information to be submitted in a Final Safety Analysis Report (FSAR) Supplement as required by 10 CFR 54.21(d) for the License Renewal Application (LRA). The LRA contains the technical information required by 10 CFR 54.21(a) and (c). Section 3 of the LRA contains the results of the aging management reviews. The programs and activities credited to manage the effects of aging are described in LRA Appendix B. Section 4 of the LRA documents the evaluations of time-limited aging analyses for the period of extended operation. LRA Section 3, Section 4, and Appendix B have been used to prepare the program and activity descriptions that are contained in this appendix. In addition, this appendix contains a listing of commitments associated with license renewal. The information presented in LRA Sections A.1.2, A.1.3, and A.1.4 will be incorporated into the FSAR following issuance of the renewed operating license. The listing of commitments for license renewal in LRA Section A.1.5 is provided for information, but will not be included in the FSAR. The license renewal commitments will be tracked within the Columbia regulatory commitment management program (see Commitment Item Number 57).

A.1.1 New FSAR Section

The information contained in LRA Sections A.1.2, A.1.3, and A.1.4 will be incorporated into the FSAR to document aging management programs and activities credited in the Columbia integrated plant assessment and time-limited aging analyses evaluated for the period of extended operation.

A.1.2 Aging Management Program and Activities

The license renewal integrated plant assessment identified existing and new aging management programs necessary to provide reasonable assurance that components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis (CLB) for the period of extended operation. This section describes the aging management programs and activities identified during the integrated plant assessment. The aging management programs will be implemented prior to the period of extended operation. One-time inspections will be conducted within the 10-year period prior to beginning the period of extended operation. The aging management programs identified as necessary in association with the evaluation of time-limited aging analyses are described in Section A.1.3.

Three elements of an effective aging management program that are common to each of the aging management programs are corrective actions, confirmation process, and administrative controls. These elements are included in the Operational Quality

Assurance Program Description (OQAPD) for Columbia, which implements the requirements of 10 CFR 50, Appendix B.

Prior to the period of extended operation, the elements of corrective actions, confirmation process, and administrative controls in the OQAPD will be applied to required aging management programs for both safety-related and non-safety related structures and components determined to require aging management during the period of extended operation.

A.1.2.1 Aboveground Steel Tanks Inspection

The Aboveground Steel Tanks Inspection detects and characterizes the conditions on the bottom surfaces of the condensate storage tanks. The inspection provides direct evidence through volumetric examination as to whether, and to what extent, a loss of material due to corrosion has occurred in inaccessible areas (i.e., tank base and bottom surface).

The Aboveground Steel Tanks Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.2 Air Quality Sampling Program

The Air Quality Sampling Program is an existing prevention and condition monitoring program that manages loss of material due to corrosion for Diesel Starting Air (DSA) components that contain compressed air through periodic sampling of the air for hydrocarbons, dewpoint, and particulates and periodic ultrasonic inspection of the DSA System air receivers. In addition, the Air Quality Sampling Program ensures that the Control Air System remains dry and free of contaminants, such that no aging effects require management.

The Air Quality Sampling Program is supplemented by the Diesel Starting Air Inspection, which provides verification of the effectiveness of the program in mitigating the effects of aging in the DSA System dryers and the downstream piping and components (excluding the DSA System air receivers).

A.1.2.3 Appendix J Program

The Appendix J Program is an existing monitoring program that detects degradation of the Primary Containment and systems penetrating the Primary Containment, which are the containment shell and primary containment penetrations including (but not limited to) the personnel airlock, equipment hatch, control rod drive hatch, and drywell head. The Appendix J Program provides assurance that leakage from the Primary Containment will not exceed maximum values for containment leakage.

A.1.2.4 Bolting Integrity Program

The Bolting Integrity Program is a combination of existing activities that, in conjunction with other credited programs, address the management of aging for the bolting of mechanical components and structural connections within the scope of license renewal. The Bolting Integrity Program relies on manufacturer and vendor information and industry recommendations for the proper selection, assembly, and maintenance of bolting for pressure-retaining closures and structural connections. The Bolting Integrity Program includes, through the Inservice Inspection (ISI) Program, Inservice Inspection (ISI) Program – IWF, Structures Monitoring Program, and External Surfaces Monitoring Program, the periodic inspection of bolting for indications of degradation such as leakage, loss of material due to corrosion, loss of pre-load, and cracking due to stress corrosion cracking (SCC) and fatigue.

A.1.2.5 Buried Piping and Tanks Inspection Program

The Buried Piping and Tanks Inspection Program manages the effects of loss of material due to corrosion on the external surfaces of piping and tanks exposed to a buried environment. The Buried Piping and Tanks Inspection Program is a combination of a mitigation program (consisting of protective coatings) and a condition monitoring program (consisting of visual inspections).

An inspection of buried piping will be performed within the 10-year period prior to entering the period of extended operation. An additional inspection of buried piping will be performed within 10 years after entering the period of extended operation.

The Buried Piping and Tanks Inspection Program is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.6 BWR Feedwater Nozzle Program

The BWR Feedwater Nozzle Program is an existing program that manages cracking due to stress corrosion cracking and intergranular attack (SCC/IGA) and flaw growth of the feedwater nozzles. The BWR Feedwater Nozzle Program is in accordance with ASME Section XI and NRC augmented requirements.

The BWR Feedwater Nozzle Program consists of: (a) enhanced inservice inspection in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWB, Table IWB 2500-1 (2001 edition including the 2002 and 2003 Addenda) and the recommendations of General Electric report NE-523-A71-0594-A [Reference A.1.4-1], and (b) system modifications, as described in FSAR Section 5.3.3.1.4.5, to mitigate cracking. The program specifies periodic ultrasonic inspection of critical regions of the feedwater nozzles.

The BWR Feedwater Nozzle Program credits portions of the Inservice Inspection (ISI) Program.

A.1.2.7 BWR Penetrations Program

The BWR Penetrations Program is an existing condition monitoring program that manages cracking due to SCC or intergranular stress corrosion cracking (IGSCC) of reactor vessel instrument penetrations, jet pump instrument penetrations, control rod drive penetrations, and incore instrument penetrations. The BWR Penetrations Program detects and sizes cracks in accordance with the guidelines of approved Boiling Water Reactor Vessel and Internals Project (BWRVIP) documents and the requirements of the ASME Boiler and Pressure Vessel Code, Section XI. The BWR Water Chemistry Program monitors and controls reactor coolant water chemistry in accordance with BWRVIP guidelines to ensure the long-term integrity and safe operation of the vessel components.

The program credits portions of the Inservice Inspection (ISI) Program and the BWR Vessel Internals Program.

A.1.2.8 BWR Stress Corrosion Cracking Program

The BWR Stress Corrosion Cracking Program is an existing condition monitoring program that manages cracking due to SCC/IGA for stainless steel and nickel alloy reactor coolant pressure boundary piping, nozzle safe ends, nozzle thermal sleeves, valve bodies, flow elements, and pump casings.

The BWR Stress Corrosion Cracking Program consists of (a) preventive measures to mitigate SCC/IGA, and (b) inspection and flaw evaluation to monitor SCC/IGA and its effects. The BWR Water Chemistry Program monitors and controls reactor coolant water chemistry in accordance with BWRVIP guidelines to ensure the long-term mitigation of SCC/IGA. The program includes the scope of the Generic Letter 88-01 program, as modified by the staff-approved BWRVIP-75 report.

The program credits portions of the Inservice Inspection (ISI) Program and the BWR Water Chemistry Program.

A.1.2.9 BWR Vessel ID Attachment Welds Program

The BWR Vessel ID Attachment Welds Program is an existing program that manages cracking due to SCC/IGA of the welds for internal attachments to the reactor vessel. The BWR Vessel ID Attachment Welds Program performs examinations and inspections as required by ASME Section XI, augmented by BWRVIP-48-A. These inspections include enhanced visual inspections with resolution to the guidelines in BWRVIP-03. The BWR Water Chemistry Program monitors and controls reactor coolant water chemistry in accordance with BWRVIP guidelines to ensure the long-term integrity and safe operation of the vessel internal attachment welds.

The BWR Vessel ID Attachment Welds Program credits portions of the BWR Vessel Internals Program and the Inservice Inspection (ISI) Program.

A.1.2.10 BWR Vessel Internals Program

The BWR Vessel Internals Program is an existing condition monitoring program that manages cracking due to stress corrosion cracking and irradiation assisted stress corrosion cracking (SCC/IASCC), SCC/IGA, flaw growth, and flow-induced vibration for various components and subcomponents of the reactor vessel internals. The BWR Vessel Internals Program consists of mitigation, inspection, flaw evaluation, and repair in accordance with the guidelines of BWRVIP reports and the requirements of the ASME Boiler and Pressure Vessel Code, Section XI. The BWR Water Chemistry Program monitors and controls reactor coolant water chemistry in accordance with BWRVIP guidelines to ensure the long-term integrity and safe operation of the vessel internal components.

The BWR Vessel Internals Program credits portions of the Inservice Inspection (ISI) Program.

A.1.2.11 BWR Water Chemistry Program

The BWR Water Chemistry Program is an existing program that mitigates degradation of components that are within the scope of license renewal and contain or are exposed to treated water, treated water in the steam phase, reactor coolant, or treated water in a sodium pentaborate solution. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material due to corrosion or erosion, cracking due to SCC, or reduction in heat transfer due to fouling through proper monitoring and control of chemical concentrations consistent with BWRVIP water chemistry guidelines.

The BWR Water Chemistry Program is supplemented by the Chemistry Program Effectiveness Inspection and the Heat Exchangers Inspection, to provide verification of the effectiveness of the program in managing the effects of aging. Additionally, the BWR Water Chemistry Program is supplemented by the BWR Feedwater Nozzle Program, BWR Stress Corrosion Cracking Program, BWR Penetrations Program, BWR Vessel ID Attachment Welds Program, BWR Vessel Internals Program, Inservice Inspection (ISI) Program, and Small Bore Class 1 Piping Inspection to provide verification of the program's effectiveness in managing the effects of aging for reactor pressure vessel, reactor vessel internals, and reactor coolant pressure boundary components.

A.1.2.12 Chemistry Program Effectiveness Inspection

The Chemistry Program Effectiveness Inspection detects and characterizes the condition of materials in representative low flow and stagnant areas of systems with water chemistry controlled by the BWR Water Chemistry Program or the Closed Cooling Water Chemistry Program, and with fuel oil chemistry controlled by the Fuel Oil Chemistry Program. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred. The inspection also determines whether cracking due to SCC of susceptible materials in susceptible locations has occurred.

The Chemistry Program Effectiveness Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.13 Closed Cooling Water Chemistry Program

The Closed Cooling Water Chemistry Program mitigates degradation of components that are within the scope of license renewal and contain closed cooling water. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material due to corrosion or erosion, cracking due to SCC, or reduction in heat transfer due to fouling through proper monitoring and control of corrosion inhibitor concentrations consistent with EPRI closed cooling water chemistry guidelines.

The Closed Cooling Water Chemistry Program includes corrosion rate measurement in reactor building closed cooling water locations and is supplemented by the one-time Chemistry Program Effectiveness Inspection and Heat Exchangers Inspection, which provide verification of the effectiveness of the program in managing the effects of aging.

The Closed Cooling Water Chemistry Program is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.14 Cooling Units Inspection

The Cooling Units Inspection detects and characterizes the material condition of aluminum, steel, copper alloy, and stainless steel cooling unit components that are exposed to condensation. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion, a reduction in heat transfer due to fouling of heat exchanger tubes and fins, or cracking due to SCC of aluminum components, has occurred.

The Cooling Units Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.15 CRDRL Nozzle Program

The CRDRL Nozzle Program is an existing mitigation and condition monitoring program that manages cracking due to flaw growth of the control rod drive return line (CRDRL) nozzle, safe end, cap, and connecting welds. The CRDRL Nozzle Program consists of a) mitigation activities, and b) inspection, flaw evaluation, and repair in accordance with the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWB, Table IWB 2500-1 (2001 Edition through 2003 Addenda) and the recommendations of NUREG-0619. System modifications were implemented by the original equipment manufacturer prior to initial startup to mitigate cracking. The BWR Water Chemistry Program monitors and controls reactor coolant water chemistry in accordance with BWRVIP guidelines to ensure the long-term integrity and safe operation of the critical regions of the CRDRL nozzle.

The CRDRL Nozzle Program credits portions of the Inservice Inspection (ISI) Program.

A.1.2.16 Diesel Starting Air Inspection

The Diesel Starting Air Inspection detects and characterizes the condition of materials for the DSA System air dryers and downstream piping and components (excluding the DSA System air receivers). The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred.

The Diesel Starting Air Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.17 Diesel Systems Inspection

The Diesel Systems Inspection detects and characterizes the condition of materials for the interior of the exhaust piping for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust System, including the loop seal drains from the exhaust piping, and the drain pans and drain piping associated with air-handling units of the Diesel Building HVAC systems. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred.

The Diesel Systems Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.18 Diesel-Driven Fire Pumps Inspection

The Diesel-Driven Fire Pumps Inspection detects and characterizes the material condition of the interior of the Fire Protection System diesel engine exhaust piping, and of Fire Protection System diesel heat exchangers exposed to a raw water environment.

The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion or erosion, or a reduction in heat transfer due to fouling has occurred. The inspection also determines whether cracking due to SCC of susceptible materials has occurred.

The Diesel-Driven Fire Pumps Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.19 Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program is an inspection program that detects degradation of electrical cables and connections that are not environmentally qualified and are within the scope of license renewal. The program provides for periodic visual inspection of accessible, non-environmentally qualified cables and connections in order to determine if age-related degradation is occurring, particularly in plant areas with adverse localized environments. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified design or bounding plant environment for the general area.

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program is a new aging management program that will be implemented prior to the period of extended operation. The inspection frequency of the program will be once every 10 years, with the initial inspection to be performed prior to the period of extended operation.

A.1.2.20 Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program is a monitoring program that detects degradation of electrical cables and connections that are not environmentally qualified and used in circuits with sensitive, low-current applications (such as radiation monitoring and nuclear instrumentation loops). The program provides for a review of calibration records for the low-current instruments, in order to detect and identify degradation of the cable system insulation resistance. The program retains the option to perform direct cable testing.

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program is a new aging management program that will be implemented prior to the period of extended operation. The frequency of the program will be once every 10 years, with the initial review to be performed prior to the period of extended operation.

A.1.2.21 Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection

The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection detects and characterizes the material condition of metallic electrical connections within the scope of license renewal. The inspection uses thermography (augmented by contact resistance testing) to detect loose or degraded connections that lead to increased resistance for a representative sample of metallic electrical connections in various plant locations.

The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.22 EQ Program

Environmental qualification (EQ) analyses for electrical components with a qualified life of 40 years or greater are identified as TLAAs; therefore, the effects of aging must be addressed for license renewal.

NRC regulation 10 CFR 50.49, “Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants,” requires licensees to identify electrical equipment covered under this regulation and to maintain a qualification file demonstrating that the equipment is qualified for its application and will perform its safety function up to the end of its qualified life. The EQ Program is an existing program that implements the requirements of 10 CFR 50.49 (as further defined by the Division of Operating Reactor Guidelines, NUREG-0588, and Regulatory Guide 1.89 Revision 1).

In accordance with 10 CFR 54.21(c)(1)(iii), the EQ Program will be used to manage the effects of aging on the intended functions of the components associated with EQ TLAAs for the period of extended operation.

A.1.2.23 External Surfaces Monitoring Program

The External Surfaces Monitoring Program consists of observation and surveillance activities intended to detect degradation resulting from loss of material due to corrosion and cracking due to SCC for mechanical components, as well as hardening and loss of strength for elastomers. The External Surfaces Monitoring Program is a condition-monitoring program.

The External Surfaces Monitoring Program is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.24 Fatigue Monitoring Program

Fatigue evaluations for mechanical components are identified as TLAAs; therefore, the effects of fatigue have been addressed for license renewal.

Columbia monitors fatigue of various components (including ASME Class 1 reactor coolant pressure boundary, high energy line break locations, and Primary Containment) via the Fatigue Monitoring Program, which tracks transient cycles and calculates fatigue usage. Columbia has assessed the impact of the reactor coolant environment on the sample of critical components identified in NUREG/CR-6260. Calculation of fatigue usage values is not required for non-Class 1 SSCs. Instead, stress intensification factors and lower stress allowables are used to ensure components are adequately designed for fatigue.

In accordance with 10 CFR 54.21(c)(1)(iii), the Fatigue Monitoring Program will be used to manage the effects of aging due to fatigue on the intended functions of the components associated with fatigue TLAAs for the period of extended operation.

The Fatigue Monitoring Program is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.25 Fire Protection Program

The Fire Protection Program is an existing program, described in Appendix F of the FSAR, that detects degradation of components in the scope of license renewal that have fire barrier functions. Periodic visual inspections and functional tests are performed of fire dampers, fire barrier walls, ceilings and floors, fire-rated penetration seals, fire wraps, fire proofing, and fire doors to ensure that functionality and operability are maintained. In addition, the Fire Protection Program supplements the Fuel Oil Chemistry Program and External Surfaces Monitoring Program through performance monitoring of the diesel-driven fire pump fuel oil supply components and testing and inspection of the halon suppression system, respectively. The Fire Protection Program is a condition monitoring program, comprised of tests and inspections based on National Fire Protection Association (NFPA) recommendations.

A.1.2.26 Fire Water Program

The Fire Water Program (sub-program of the overall Fire Protection Program) is described in Appendix F of the FSAR, and is credited with managing loss of material due to corrosion, erosion, macrofouling, and selective leaching, cracking due to SCC/IGA of susceptible water-based fire suppression components in the scope of license renewal. Periodic inspection and testing of the water-based fire suppression systems provides reasonable assurance that the systems will remain capable of performing their intended function. Periodic inspection and testing activities include hydrant and hose station inspections, fire main flushing, flow tests, and sprinkler inspections. The Fire Water Program is a condition monitoring program, comprised of tests and inspections based on NFPA recommendations.

The Fire Water Program is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.27 Flexible Connection Inspection

The Flexible Connection Inspection detects and characterizes the material condition of elastomer components exposed to treated water, dried air, gas, and indoor air environments. The inspection provides direct evidence as to whether, and to what extent, hardening and loss of strength has occurred.

The Flexible Connection Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.28 Flow-Accelerated Corrosion (FAC) Program

The Flow-Accelerated Corrosion (FAC) Program manages loss of material for steel and gray cast iron components located in the treated water environment of systems that are susceptible to FAC, also called erosion-corrosion. The FAC Program combines the elements of predictive analysis, inspections (to baseline and monitor wall-thinning), industry experience, station information gathering and communication, and engineering judgment to monitor and predict FAC wear rates. The program is a condition monitoring program that implements the recommendations of NRC Generic Letter 89-08, and follows the guidance and recommendations of EPRI NSAC-202L [Reference A.1.4-2], to ensure that the integrity of piping systems susceptible to FAC is maintained.

The FAC Program is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.29 Fuel Oil Chemistry Program

The Fuel Oil Chemistry Program is an existing program that maintains fuel oil quality in order to mitigate degradation of the storage tanks and associated components containing fuel oil that are within the scope of license renewal. The program includes diesel fuel oil testing for emergency diesel generator and diesel-driven fire pump fuel. The Fuel Oil Chemistry Program manages the relevant conditions that could lead to the onset and propagation of loss of material due to corrosion, or cracking due to SCC of susceptible copper alloys, through proper monitoring and control of fuel oil contamination consistent with plant technical specifications and American Society for Testing and Materials (ASTM) standards for fuel oil. The relevant conditions are specific contaminants such as water or microbiological organisms in the fuel oil that could lead to corrosion of susceptible materials. Exposure to these contaminants is minimized by verifying the quality of new fuel oil before it enters the emergency diesel generator storage tanks and by periodic sampling to ensure that both the emergency diesel generator tanks and fire protection tanks are free of water and particulates. The Fuel Oil Chemistry Program is a mitigation program.

The Fuel Oil Chemistry Program is supplemented by the Chemistry Program Effectiveness Inspection, which provides verification of the effectiveness of the program in mitigating the effects of aging.

A.1.2.30 Heat Exchangers Inspection

The Heat Exchangers Inspection detects and characterizes the surface conditions with respect to fouling of heat exchangers and coolers that are in the scope of the inspection and exposed to indoor air or to water with the chemistry controlled by the BWR Water Chemistry Program or the Closed Cooling Water Chemistry Program. The inspection provides direct evidence as to whether, and to what extent, a reduction of heat transfer due to fouling has occurred on the heat transfer surfaces of heat exchangers and coolers.

The Heat Exchangers Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.31 High-Voltage Porcelain Insulators Aging Management Program

The High-Voltage Porcelain Insulators Aging Management Program is an existing program that manages the build-up of contamination (hard water residue) on the surfaces of the 115-kV high-voltage insulators. The program provides for periodic cleaning or recoating of insulators and visual inspection of the coating (if present) on the high-voltage porcelain insulators between the 115-kV backup transformer and circuit breaker E-CB-TRB located in the station transformer yard.

The High-Voltage Porcelain Insulators Aging Management Program is a preventive maintenance program consisting of activities to mitigate potential degradation of the insulation function due to hard water deposits. Uncoated insulators are inspected and cleaned every two years. Coated insulators are visually inspected for damage every two years and are re-coated every 10 years.

A.1.2.32 Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program manages the aging of inaccessible medium-voltage cables that are not environmentally qualified and are within the scope of license renewal. The program provides for testing to identify the conditions of the conductor insulation, and also provides for periodic inspection and drainage (if necessary) of electrical manholes.

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program is a new aging management program that will be implemented prior to the period of extended operation. The frequency of the cable testing portion of the program will be once every 10 years, with the first test to be performed prior to the period of extended operation. The frequency of the manhole inspections will be at least once every two years, with the first inspections to be performed prior to the period of extended operation.

A.1.2.33 Inservice Inspection (ISI) Program

The Inservice Inspection (ISI) Program is an existing condition monitoring program that manages cracking due to SCC/IGA and flaw growth of multiple reactor coolant system pressure boundary components, including the reactor vessel, a limited number of internals components, and the reactor coolant system pressure boundary. The Inservice Inspection (ISI) Program also manages loss of material due to corrosion for reactor vessel internals components and reduction of fracture toughness due to thermal embrittlement of cast austenitic stainless steel pump casings and valve bodies.

The Inservice Inspection (ISI) Program details the requirements for the examination, testing, repair, and replacement of components specified in ASME Section XI for Class 1, 2, or 3 components. The Inservice Inspection (ISI) Program complies with the ASME Code requirements.

The program scope has been augmented to include additional requirements, and components, beyond the ASME requirements. Examples include the augmentation of ISI to expanded reactor vessel feedwater nozzle examinations, examinations of high energy line piping systems that penetrate containment, and examinations per Generic Letter 88-01. Such augmentation is consistent with the ISI program description in NUREG-1801, Section XI.M1.

A.1.2.34 Inservice Inspection (ISI) Program – IWE

The Inservice Inspection (ISI) Program – IWE is an existing program that establishes responsibilities and requirements for conducting IWE inspections as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWE includes visual examination of all accessible surface areas of the steel containment and its integral attachments, and containment pressure-retaining bolting in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE.

The inservice examinations conducted throughout the service life of Columbia will comply with the requirements of the ASME Section XI Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the inspection interval, subject to prior approval of the edition and addenda by the NRC. This is consistent with NRC statements of consideration for 10 CFR 54 associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

A.1.2.35 Inservice Inspection (ISI) Program – IWF

The Inservice Inspection (ISI) Program – IWF is an existing program that establishes responsibilities and requirements for conducting IWF Inspections for ASME Class 1, 2, and 3 component supports as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWF performs visual examination of supports based on sampling of the total support population. The sample size varies depending on the ASME Class. The largest sample size is specified for the most critical supports (ASME Class 1 and those other than piping supports (Class 1, 2, 3, and MC)). The sample size decreases for the less critical supports (ASME Class 2 and 3). The primary inspection method employed is visual examination. Degradation that potentially compromises support function or load capacity is identified for evaluation. Supports requiring corrective actions are re-examined during the next inspection period in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWF.

The inservice examinations conducted throughout the service life of Columbia will comply with the requirements of the ASME Section XI Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the inspection interval, subject to prior approval of the edition and addenda by the NRC. This is consistent with NRC statements of consideration for 10 CFR 54 associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

A.1.2.36 Lubricating Oil Analysis Program

The Lubricating Oil Analysis Program manages loss of material due to corrosion or selective leaching of susceptible materials and reduction of heat transfer due to fouling for plant components that are within the scope of license renewal and exposed to a lubricating oil environment. The Lubricating Oil Analysis Program is a mitigation program.

The Lubricating Oil Analysis Program is supplemented by the Lubricating Oil Inspection, which provides verification of the effectiveness of the program in mitigating the effects of aging.

The Lubricating Oil Analysis Program is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.37 Lubricating Oil Inspection

The Lubricating Oil Inspection detects and characterizes the condition of materials in systems and components for which the Lubricating Oil Analysis Program is credited with aging management. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion or selective leaching has occurred. The inspection also determines whether a reduction in heat transfer due to fouling has occurred.

The Lubricating Oil Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.38 Masonry Wall Inspection

The Masonry Wall Inspection consists of inspection activities to detect cracking of masonry walls within the scope of license renewal. Masonry walls that perform a fire barrier intended function are also managed by the Fire Protection Program. The Masonry Wall Inspection is implemented as part of the Structures Monitoring Program. The Masonry Wall Inspection performs visual inspection of external surfaces of masonry walls.

The Masonry Wall Inspection is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.39 Material Handling System Inspection Program

The Material Handling System Inspection Program manages loss of material for cranes (including bridge, trolley, rails, and girders), monorails, and hoists within the scope of license renewal. The Material Handling System Inspection Program is based on guidance contained in ANSI B30.2 for overhead and gantry cranes, ANSI B30.11 for monorail systems and underhung cranes, and ANSI B30.16 for overhead hoists.

The Material Handling System Inspection Program is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.40 Metal-Enclosed Bus Program

The Metal-Enclosed Bus Program is an inspection program that detects degradation of metal-enclosed bus within the scope of license renewal. The program provides for the visual inspection of interior sections of bus, and an inspection of the elastomeric seals at the joints of the duct sections. The program also makes provision for thermographic inspection of bus bolted connections.

The Metal-Enclosed Bus Program is a new aging management program that will be implemented prior to the period of extended operation. The thermography portion of the program will be performed once every 10 years, with the initial inspections to be performed prior to the period of extended operation. The visual inspection portion of the program will also be performed once every 10 years, with the first inspections to be performed prior to the period of extended operation.

A.1.2.41 Monitoring and Collection Systems Inspection

The Monitoring and Collection Systems Inspection detects and characterizes the condition of materials at the internal surfaces of subject mechanical components that are exposed to equipment or area drainage water and other potential contaminants and fluids. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion or erosion has occurred. The inspection also determines whether cracking due to SCC of susceptible materials has occurred.

The Monitoring and Collection Systems Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.42 Open-Cycle Cooling Water Program

The Open-Cycle Cooling Water Program manages cracking due to SCC of susceptible materials and loss of material due to corrosion and erosion for components located in the Standby Service Water and Plant Service Water systems, and for components connected to or serviced by those systems. The program manages fouling due to particulates (e.g., corrosion products) and biological material (micro- or macro-organisms) resulting in reduction in heat transfer for heat exchangers (including condensers, coolers, cooling coils, and evaporators) within the scope of the program. The Open-Cycle Cooling Water Program also manages loss of material for components associated with the feed-and-bleed mode for emergency makeup water to the spray pond.

The Open-Cycle Cooling Water Program consists of inspections, surveillances, and testing to detect the presence, and assess the extent of cracking, fouling, and loss of material. The inspection activities are combined with chemical treatments and cleaning activities to minimize the effects of aging. The program is a combination condition monitoring and mitigation program that implements the recommendations of NRC Generic Letter 89-13 for safety-related equipment in the scope of the program. The scope of the program also includes non-safety related components containing either service water or spray pond makeup water.

The Open-Cycle Cooling Water Program is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.43 Potable Water Monitoring Program

The Potable Water Monitoring Program is a mitigation program that, by means of chemical water treatment, manages loss of material due to corrosion and erosion for components that contain potable water.

The Potable Water Monitoring Program is an existing program that requires enhancement prior to the period of extended operation. At least one inspection will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.44 Preventive Maintenance – RCIC Turbine Casing

Preventive Maintenance – RCIC Turbine Casing is an existing program that manages loss of material due to corrosion for the reactor core isolation cooling (RCIC) pump turbine casing and associated piping components downstream from the steam admission valve. These components are exposed to steam during RCIC system operation and testing, but are empty during normal plant operating conditions. Preventive Maintenance – RCIC Turbine Casing is a condition monitoring program comprised of periodic inspection and surveillance activities to detect aging and age-related degradation.

A.1.2.45 Reactor Head Closure Studs Program

The Reactor Head Closure Studs Program is an existing program that manages cracking due to SCC and loss of material due to corrosion for the reactor head closure stud assemblies (studs, nuts, washers, and bushings). The Reactor Head Closure Studs Program examines reactor vessel stud assemblies in accordance with the examination and inspection requirements specified in the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWB (edition and addenda described in the Inservice Inspection (ISI) Program), Table IWB 2500-1. The Reactor Head Closure Studs Program includes preventive measures in accordance with Regulatory Guide 1.65 to mitigate cracking.

The Reactor Head Closure Studs Program credits portions of the Inservice (ISI) Inspection Program.

A.1.2.46 Reactor Vessel Surveillance Program

The Reactor Vessel Surveillance Program is an existing condition monitoring program that manages reduction of fracture toughness due to radiation embrittlement for the low alloy steel reactor vessel shell and welds in the beltline region. The Reactor Vessel Surveillance Program incorporates the BWRVIP Integrated Surveillance Program (ISP), as described in reports BWRVIP-86-A and BWRVIP-116.

Energy Northwest follows the requirements of the BWRVIP ISP and applies the ISP data to Columbia. The NRC has approved the use of the BWRVIP ISP in place of a unique plant program for Columbia.

The provisions of 10 CFR 50 Appendix G require Columbia to operate within the currently licensed pressure-temperature (P-T) limit curves, and to update these curves as necessary. The P-T limit curves, as contained in plant technical specifications, will be updated as necessary through the period of extended operation as part of the Reactor Vessel Surveillance Program. Reactor vessel P-T limits will thus be managed for the period of extended operation.

A.1.2.47 Selective Leaching Inspection

The Selective Leaching Inspection detects and characterizes the conditions on internal and external surfaces of subject components exposed to raw water, treated water, fuel oil, soil, and moist air (including condensation) environments. The inspection provides direct evidence through a combination of visual examination and hardness testing, or NRC-approved alternative, as to whether, and to what extent, a loss of material due to selective leaching has occurred.

The Selective Leaching Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.48 Service Air System Inspection

The Service Air System Inspection detects and characterizes the material condition of steel piping and valve bodies exposed to an “air (internal)” (i.e., compressed air) environment within the license renewal boundary of the Service Air System. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred.

The Service Air System Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.49 Small Bore Class 1 Piping Inspection

The Small Bore Class 1 Piping Inspection will detect and characterize the conditions on the internal surfaces of small bore Class 1 piping components that are exposed to reactor coolant. The Small Bore Class 1 Piping Inspection will provide physical evidence as to whether, and to what extent, cracking due to SCC or to thermal or mechanical loading has occurred in small bore Class 1 piping components. The Small Bore Class 1 Piping Inspection will also verify, by inspections for cracking, that reduction of fracture toughness due to thermal embrittlement requires no additional aging management for small bore cast austenitic stainless steel valves.

The Small Bore Class 1 Piping Inspection includes visual and volumetric inspection of a representative sample of small bore Class 1 piping components. The inspection provides additional assurance that cracking of small bore Class 1 piping is not occurring or is insignificant, such that an aging management program is not warranted during the period of extended operation. This one-time inspection is appropriate as Columbia has not experienced cracking of small bore Class 1 piping from stress corrosion or thermal and mechanical loading. Should evidence of significant aging be revealed by the one-time inspection or through plant operating experience, periodic inspection will be considered as a plant-specific aging management program.

The Small Bore Class 1 Piping Inspection credits portions of the Inservice Inspection (ISI) Program. The Small Bore Class 1 Piping Inspection is credited to verify the effectiveness of the BWR Water Chemistry Program in mitigating cracking of small bore piping and piping components.

The Small Bore Class 1 Piping Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the portion of the fourth 10-year ISI interval that occurs prior to the period of extended operation.

A.1.2.50 Structures Monitoring Program

The Structures Monitoring Program manages age-related degradation of plant structures and structural components within its scope to ensure that each structure or structural component retains the ability to perform its intended function. Aging effects are detected by visual inspection of external surfaces prior to the loss of the structure's or component's intended function. The Structures Monitoring Program encompasses and implements the Water Control Structures Inspection and the Masonry Wall Inspection. This program implements provisions of the Maintenance Rule, 10 CFR 50.65, that relate to structures, masonry walls, and water control structures. Concrete and masonry walls that perform a fire barrier intended function are also managed by the Fire Protection Program.

The Structures Monitoring Program is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.51 Supplemental Piping/Tank Inspection

The Supplemental Piping/Tank Inspection detects and characterizes the material condition of steel, gray cast iron, and stainless steel components exposed to moist air environments. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred.

The Supplemental Piping/Tank Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.52 Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will manage reduction of fracture toughness due to thermal aging and neutron irradiation embrittlement of CASS reactor vessel internals.

The program includes: (a) identification of susceptible components determined to be limiting from the standpoint of thermal aging or neutron irradiation embrittlement (neutron fluence), (b) a component-specific evaluation to determine each identified component's susceptibility to reduction of fracture toughness, and (c) a supplemental examination of any component not eliminated by the component-specific evaluation.

The program credits portions of the Inservice Inspection (ISI) Program and the BWR Vessel Internals Program.

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new aging management program that will be implemented prior to the period of extended operation.

A.1.2.53 Water Control Structures Inspection

The Water Control Structures Inspection, implemented as part of the Structures Monitoring Program, consists of inspection activities to detect aging and age-related degradation. The Water Control Structures Inspection ensures the structural integrity and operational adequacy of the spray ponds, standby service water pump houses, circulating water pump house (including circulating water basin), makeup water pump house, cooling tower basins, and those structural components within the structures.

The Water Control Structures Inspection is an existing program that requires enhancement prior to the period of extended operation.

A.1.3 Evaluation of Time-Limited Aging Analyses

In accordance with 10 CFR 54.21(c), an application for a renewed operating license requires an evaluation of TLAAs for the period of extended operation. The following TLAAs have been identified and evaluated to meet this requirement.

A.1.3.1 Reactor Vessel Neutron Embrittlement

Neutron embrittlement is the change in mechanical properties of reactor vessel materials resulting from exposure to fast neutron flux (E>1.0 MeV) in the beltline region of the reactor core. The most pronounced material change is a reduction in fracture toughness. As fracture toughness decreases with cumulative fast neutron exposure, the material's resistance to crack propagation decreases. Fracture toughness is also dependent on temperature. The reference temperature for nil-ductility transition (RT_{NDT}) is the temperature above which the material behaves in a ductile manner and below which the material behaves in a brittle manner. As fluence increases, RT_{NDT} increases, and higher temperatures are required for the material to continue to act in a ductile manner.

Requirements associated with fracture toughness, pressure-temperature limits, and material surveillance programs for the reactor coolant pressure boundary are contained in Appendices G and H of 10 CFR 50.

The analyses associated with evaluation of the effect of neutron embrittlement on the reactor pressure vessel for 40 years are TLAAs. Neutron fluence, upper shelf energy, adjusted reference temperature (ART), and vessel P-T limits are time dependent parameters associated with fracture toughness (embrittlement) of reactor vessel materials.

A.1.3.1.1 Neutron Fluence

EFPY Projection

To evaluate the effects of radiation on reactor pressure vessel material embrittlement, the results of analyses were projected to determine neutron fluence out to 54 effective full power years (EFPY). Using actual reactor core power histories through 2007 and conservative estimates of future core designs, extended operation to 60 years was determined to be bounded by 54 EFPY.

Fluence Projection

Analyzed fluence values at 51.6 EFPY of reactor operation are addressed in FSAR Section 4.3.2.8 and FSAR Table 4.3-1. These fluence analyses are based on the original licensed thermal power of 3323 mega-watt thermal (MWt) through fuel cycle 10, and the currently licensed thermal power uprated to 3486 MWt from cycle 11 through the end of operation. These fluence analyses use NRC-approved methodology based on the guidance of Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence." The fluence analyses were projected to 54 EFPY for the extended operating period of 60 years.

Beltline Evaluation

For the extended operating period, ferritic materials for vessel beltline shells, welds, and assembly components are required to be evaluated for neutron irradiation embrittlement if high energy neutron fluence is greater than a threshold value of 1E+17 n/cm^2 (E >1 MeV) at the end of the 60 years. The only vessel assembly items, other than the shells and welds of the beltline region that would experience neutron fluence greater than 1E+17 n/cm^2 during the period of extended operation are instrumentation nozzle N12 and residual heat removal/low pressure coolant injection (RHR/LPCI) nozzle N6.

Instrumentation nozzle N12 has a thickness less than 2.5 inches and therefore does not require a fracture toughness evaluation per ASME Code Appendix G, Section G2223.

Nozzle N6 is evaluated for ART below. The ART for this nozzle is less than that for the highest weld and plate. Consequently, nozzle N6 is not the limiting material for the vessel, and thus is not a beltline component. However, as nozzle N6 was evaluated for ART it meets the definition of a beltline component per 10 CFR 50, Appendix G.

The beltline definition for the period of extended operation includes the lower shell (Course #1 / Ring #21), lower-intermediate shell (Course #2 / Ring #22), associated vertical (longitudinal) welds, the girth (circumferential) weld that connects the lower and lower-intermediate shells, and nozzle N6.

Disposition

Neutron fluence is not a TLAA, it is a time-limited assumption used in various neutron embrittlement TLAAs.

A.1.3.1.2 Upper Shelf Energy Evaluation

10 CFR 50 Appendix G requires the upper shelf energy (USE) of the vessel beltline materials to remain above 50 ft-lb at all times during plant operation, including the effects of neutron radiation. If USE cannot be shown to remain above this limit, then an equivalent margin analysis (EMA) must be performed to show that the margins of safety against fracture are equivalent to those required by Appendix G of Section XI of the ASME Code.

The initial (unirradiated) USE is not known for all the Columbia vessel plates and welds. For those plates and welds for which the initial USE is known, USE was projected using Regulatory Guide 1.99, Revision 2 methods. For the vessel plates and welds for which the initial USE is not known, USE equivalent margin analyses were performed using the Boiling Water Reactor Owners Group (BWROG) equivalent margin analysis (EMA) methodology. Results from the testing and analysis of surveillance materials were used in the EMA analyses.

All of the projected USE values for the vessel beltline plates and welds for which the initial USE is known remain above 50 ft-lbs through the end of the period of extended operation (54 EFPY). For the vessel beltline plates and welds for which the initial USE is not known, the maximum decrease in USE was found to be less than the assumed decrease in the associated equivalent margin analyses. The maximum predicted decreases in USE for 54 EFPY for these beltline plates and welds are bounded by the equivalent margin analyses. Therefore, the projected USE for the vessel beltline plates and welds is acceptable for the period of extended operation.

Disposition

Reactor vessel upper shelf energy TLAAs have been projected to the end of the period of extended operation.

A.1.3.1.3 Adjusted Reference Temperature Analysis

In addition to USE, the other key parameter that characterizes the fracture toughness of a material is the RT_{NDT}. This reference temperature changes as a function of exposure to neutron radiation resulting in an adjusted reference temperature, ART.

The initial RT_{NDT} is the reference temperature for the unirradiated material. The change due to neutron radiation is referred to as ΔRT_{NDT}. The ART is calculated by adding the initial RT_{NDT}, the ΔRT_{NDT}, and a margin to account for uncertainties as prescribed in Regulatory Guide 1.99, Revision 2.

The ART evaluations of record for the vessel beltline plates and welds for the currently licensed period (33.1 EFPY) include power uprate conditions. Based on projected fluence values, the methodology in Regulatory Guide 1.99 was used to project the ART for 54 EFPY. The ART values projected to 54 EFPY are used to develop P-T limit curves. Projected ART values are well below the 200°F end of life ART suggested in Section 3 of Regulatory Guide 1.99 and are, thus, acceptable for the period of extended operation.

Disposition

Reactor vessel adjusted reference temperature TLAAs have been projected to the end of the period of extended operation.

A.1.3.1.4 Pressure-Temperature Limits

To ensure that adequate margins of safety are maintained for various modes of reactor operation, 10 CFR 50, Appendix G specifies pressure and temperature requirements for affected materials for the service life of the reactor vessel. The basis for these fracture toughness requirements is ASME Section XI, Appendix G. The ASME Code requires P-T limits be established for hydrostatic pressure tests and leak tests; for operation with the core not critical during heatup and cooldown; and for core critical operation.

The Columbia P-T limit curves were revised in 2005 to include the effects of power uprate to 3486 MWt. The P-T limits are valid for 33.1 EFPY through the end of the currently licensed period. P-T limits for the period of extended operation will be calculated using the most accurate fluence projections available at the time of the recalculation. The projections may be adjusted if there are changes in core design or if additional surveillance capsule results show the need for an adjustment. The projected ART for the period of extended operation gives confidence that future P-T curves will provide adequate operating margin.

License amendment requests to revise the P-T limits will be submitted to the NRC for approval, when necessary to comply with 10 CFR 50 Appendix G, as part of the Reactor Vessel Surveillance Program.

Disposition

The TLAA for P-T limits will be adequately managed for the period of extended operation as part of the Reactor Vessel Surveillance Program.

A.1.3.1.5 Reactor Vessel Circumferential Weld Inspection Relief

BWRVIP-74-A, "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal," reiterated the recommendation of BWRVIP-05, "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations," that vessel circumferential welds could be exempted from examination. The NRC safety evaluation report (SER) for BWRVIP-74 agreed, but required that plants apply for this relief request individually. The relief request is required to demonstrate that at the expiration of the current license, the circumferential welds will satisfy the limiting conditional failure probability in the (BWRVIP-05) evaluation. Energy Northwest requested and received permanent relief from vessel shell circumferential (girth) weld volumetric examinations through 33.1 EFPY.

The reactor pressure vessel circumferential weld parameters at 54 EFPY have been projected to remain within the bounding (64 EFPY) vessel parameters from the BWRVIP-05 SER. As such, the conditional probability of failure for circumferential welds remains below the limits contained in the SER for BWRVIP-05.

Disposition

The TLAA for reactor vessel circumferential weld examination relief has been projected to the end of the period of extended operation.

A.1.3.1.6 Reactor Vessel Axial Weld Failure Probability

The NRC SER for BWRVIP-74-A evaluated the failure frequency of axially oriented welds in BWR reactor vessels, and determined failure frequency acceptance criteria for 40 years of reactor operation. Applicants for license renewal are required to evaluate axially oriented vessel welds to show that their failure frequency remains below the acceptance criteria in the SER for BWRVIP-74. An acceptable way to do this is to show that the mean RT_{NDT} of the limiting axial beltline weld at the end of the period of extended operation is less than the values specified in the SER.

The Columbia limiting axial weld mean RT_{NDT} at 54 EFPY is projected to remain well below the RT_{NDT} from the SER for BWRVIP-74, thus the Columbia axial weld failure frequency meets the acceptable criteria.

Disposition

The TLAA for the reactor vessel axial weld failure probability has been projected to the end of the period of extended operation.

A.1.3.2 Metal Fatigue

Fatigue evaluations for mechanical components are identified as TLAAs; therefore, the effects of fatigue must be addressed for license renewal. Fatigue is an age-related degradation mechanism caused by cyclic duty on a component by either mechanical or thermal loads.

The ASME Boiler and Pressure Vessel Code requires evaluation of transient thermal and mechanical load cycles for Class 1 components. Cumulative usage factors for Class 1 components are calculated based on normal and upset design transient definitions. The design transients used to generate cumulative usage factors for Class 1 components are contained in FSAR Section 3.9.1.1. Columbia is required to monitor design transients listed in FSAR Table 3.9-1 to ensure that plant components are maintained within the design limits.

Calculation of fatigue usage values is not required for non-Class 1 SSCs. Instead, stress intensification factors and lower stress allowables are used to ensure components are adequately designed for fatigue.

The reactor coolant environmental effects of fatigue on plant components were also evaluated.

The design cycles for Columbia are summarized in FSAR Section 3.9 and FSAR Table 3.9-1. Columbia counts all fatigue significant cycles, not only for the design transients listed in FSAR Table 3.9-1 but also for the analysis of other plant components. The events listed in FSAR Table 3.9-1 have been evaluated and in some cases regrouped for easier counting. Faulted conditions listed in the FSAR are not used in the fatigue analyses and are not counted. Additional transients determined to be fatigue significant after the original design have been added to the counting procedure, while FSAR Table 3.9-1 lists the original design cycles. The projected number of occurrences of design transients to 60 years determined that some analyzed numbers of transients may be exceeded. These projections were done using linear extrapolation from the beginning of plant life. Recent operating experience suggests lower projections and as additional operating data is accumulated, subsequent projections will refine the number of cycles expected in 60 years. Columbia manages fatigue using the Fatigue Monitoring Program to track transient cycles and require corrective action before any analyzed number of cycles is reached.

A.1.3.2.1 Reactor Pressure Vessel Fatigue Analyses

The reactor vessel assembly consists of the reactor pressure vessel (RPV), the vessel support skirt, the shroud support, nozzles, penetrations, stub tubes, head closure flanges, head closure studs, refueling bellows support, and stabilizer brackets.

Design cumulative usage factors (CUFs) for the limiting RPV assembly locations are contained in design reports and were calculated based on the design transients. Columbia manages fatigue for the RPV assembly components using the Fatigue Monitoring Program to track transient cycles and requires corrective action before any analyzed number of cycles is reached.

Disposition

The effects of aging on the intended functions of the RPV will be adequately managed for the period of extended operation by the Fatigue Monitoring Program.

A.1.3.2.2 Reactor Pressure Vessel Internals

Fatigue analyses of the overall RPV internals (including the jet pump assemblies) were performed pre-startup as part of the plant design. Component specific fatigue analyses of the jet pumps were performed more recently to bound actual plant operation. Each of these analyses is discussed below.

Reactor Vessel Internals Fatigue Analyses

The RPV internals are described in terms of two assemblies: core support structures and reactor internals. Core support structures include the shroud, shroud support (included as part of the reactor vessel for fatigue), core plate with wedges and hold-down bolts, top guide, fuel supports, and control rod guide tubes. Reactor internals include the jet pump assemblies, jet pump instrumentation, feedwater spargers, vessel head spray nozzle, differential pressure line, incore flux monitor guide tubes, surveillance sample holders, core spray line (in-vessel) and spargers, incore instrument housings, low pressure coolant injection coupling, steam dryer, shroud head and steam separator assembly, guide rods, and control rod drive thermal sleeves.

The normal, test, and upset service load cycles used for the design and fatigue analysis for the core support structures and reactor internals are shown in FSAR Table 3.9-1. Calculation of CUFs for the reactor internals was performed as part of a NSSS design evaluation.

Review of the RPV internals in association with power uprate determined that stresses on the vessel internals remained well below all limits. No recalculation of cumulative usage factors was determined to be required. Columbia manages fatigue using the Fatigue Monitoring Program to track transient cycles and require corrective action before any analyzed number of cycles is reached.

Disposition

The effects of aging on the intended functions of the RPV internals will be adequately managed for the period of extended operation by the Fatigue Monitoring Program.

Jet Pump Fatigue Analyses

In August 2000, Columbia operated for a period of time with the recirculation pumps in an unbalanced mode (pump speeds different by more than 50 percent). The effect of that flow imbalance on the jet pumps was an additional accumulation of fatigue usage.

As a result of inspections during the Spring 2001 outage (R-15), a fatigue analysis of the jet pumps was performed and cumulative usage factors were determined.

Jet pump clamps were installed during the 2005 outage (R-17) to minimize flow induced vibration. These clamps greatly reduced the future potential for riser brace fatigue.

As a result of evaluations after the 2007 outage the usage factors were extended to 60 years. The maximum CUF of the jet pump risers for 60 years of operation is projected to remain below the fatigue limit. Columbia manages fatigue using the Fatigue Monitoring Program to track transient cycles and require corrective action before any analyzed number of cycles is reached. The Fatigue Monitoring Program will also monitor the occurrence of design cycles and will monitor the jet pump gaps, effectively managing the fatigue of the jet pumps through the period of extended operation.

Disposition

The effects of aging on the intended functions of the jet pumps will be adequately managed for the period of extended operation by the Fatigue Monitoring Program.

A.1.3.2.3 Reactor Coolant Pressure Boundary Piping and Piping Component Fatigue Analyses

The Class 1 boundary encompasses all reactor coolant pressure boundary piping (pipe and fittings) and in-line components subject to ASME Section XI, Subsection IWB, inspection requirements. Fatigue analyses of Class 1 piping are based on the transients found in the Columbia piping specifications that are in turn based on the design transients listed in FSAR Section 3.9.

Potential high energy line break (HELB) intermediate locations can be eliminated based on CUFs of less than 0.1 if other stress criteria are also met. The usage factors, as calculated in the design fatigue analyses, account for the design transients assumed for the original 40-year life of the plant. Therefore, the determination of CUFs used in the selection of postulated high energy line intermediate break locations are TLAAs. The Fatigue Monitoring Program will identify when the transients for piping systems are approaching their analyzed number of cycles. Prior to any transient exceeding its analyzed number of cycles for a piping system, the associated analyses will be reviewed to determine whether any additional locations need to be designated as postulated HELB locations.

All Class 1 piping was reviewed for the power uprate. The evaluation determined that there was adequate margin in each system to accommodate the power uprate. Design fatigue usage for 40 years of operation and projected fatigue usage for the period of extended operation are established for the limiting reactor coolant pressure boundary components.

A review of documentation found several fatigue analyses for Class 1 valve stress reports found fatigue analyses that were TLAAs. The fatigue usage for those valves is based on transients that are tracked by the Fatigue Monitoring Program.

Metal fatigue for all Class 1 reactor coolant pressure boundary piping and in-line components is managed by the Fatigue Monitoring Program. The Fatigue Monitoring Program will identify when the transients for piping systems are approaching their analyzed numbers of cycles. Prior to any transient exceeding its analyzed number of cycles for a piping system, the design calculations for that system will be reviewed and appropriate actions will be taken.

Disposition

The effects of aging on the intended functions of the reactor coolant pressure boundary piping and components will be adequately managed for the period of extended operation by the Fatigue Monitoring Program.

A.1.3.3 Non-Class 1 Component Fatigue Analyses

The non-Class 1 mechanical components susceptible to fatigue fit into one of two major categories: (1) piping and in-line components (piping, valves, tubing, traps, thermowells, etc.) or (2) non-piping components (vessels, heat exchangers, tanks, pumps, etc.).

Non-Class 1 components that are Quality Group B or C are designed and constructed as ASME Section III Code Class 2 and 3, respectively. The design of ASME Class 2 and 3 piping systems incorporates a stress range reduction factor for determining acceptability of piping design with respect to thermal stresses. Non-Class 1 components designated as Quality Class D are designed to ANSI B31.1, which also incorporates stress range reduction factors based upon the number of thermal cycles. In general, a stress range reduction factor of 1.0 in the stress analyses applies for up to

7,000 thermal cycles. The allowable stress range is reduced by the stress range reduction factor if the number of thermal cycles exceeds 7,000. If fewer than 7,000 cycles are expected through the period of extended operation, then the fatigue analysis (stress range reduction factor) of record will remain valid through the period of extended operation.

Because none of the non-Class 1 vessels, heat exchangers, storage tanks, or pumps were designed to ASME Section VIII, Division 2 or ASME Section III, Subsection NC-3200, no fatigue evaluation is required. Therefore, there are no fatigue TLAAs for these components.

The fatigue evaluation of non-Class 1 piping and in-line components evaluated the associated operating temperature against the threshold temperature value for fatigue of the material. If the threshold temperature value was exceeded, then the number of transient cycles for the piping or in-line component was projected. In each case, the number of projected cycles for 60 years was found to be less than 7,000 for piping and in-line components whose temperatures exceed threshold values. Therefore, fatigue for non-Class 1 piping and in-line components remains valid for the period of extended operation.

Disposition

The TLAA for non-Class 1 component fatigue analyses remains valid for the period of extended operation.

A.1.3.4 Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping

Applicants for license renewal are required to address the reactor coolant environmental effects on fatigue of plant components. The minimum set of components for a BWR of Columbia's vintage is derived from NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," as follows:

1. Reactor vessel shell and lower head
2. Reactor vessel feedwater nozzle
3. Reactor recirculation piping (including inlet and outlet nozzles)
4. Core spray line reactor vessel nozzle and associated Class 1 piping
5. Residual heat removal return line Class 1 piping
6. Feedwater line Class 1 piping

Columbia has analyzed these locations for the effects of the reactor coolant environment on fatigue in support of license renewal. Original fatigue usage calculations were reviewed, and the transient groupings and load pairs used in those analyses were carried over to the environmentally-assisted fatigue analyses, with revised non-environmentally assisted usage factors determined.

An effective fatigue life adjustment factor, F_{en}, that considers a time weighted average of operation with normal water chemistry and hydrogen water chemistry over 60 years of operation, was determined for each load pair analyzed for the components at the NUREG/CR-6260 locations. The fatigue life adjustment factors were applied to the revised component load pair usage factors, and the environmentally-adjusted usage factors were summed to obtain environmentally-adjusted CUFs to verify acceptability of the components for the period of extended operation.

Using fatigue data projected by the Fatigue Monitoring Program and the methodology summarized above, the limiting locations (a total of 14 locations corresponding to the six NUREG/CR-6260 components) were evaluated. None of the 14 locations evaluated have an environmentally adjusted CUF of greater than 1.0 during the period of extended operation.

The aging effect of fatigue, including consideration of the environmental effects, will be adequately managed for the period of extended operation using the Fatigue Monitoring Program.

Disposition

The effects of environmentally-assisted fatigue on the intended functions of the limiting NUREG/CR-6260 locations will be adequately managed for the period of extended operation using the Fatigue Monitoring Program.

A.1.3.5 Environmental Qualification of Electrical Equipment

Environmental qualification analyses for electrical equipment are identified as TLAAs. NRC regulation 10 CFR 50.49, “Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants,” requires licensees to identify electrical equipment covered under this regulation and to maintain a qualification file demonstrating that the equipment is qualified for its application and will perform its safety function up to the end of its qualified life. The EQ Program implements the requirements of 10 CFR 50.49 and will be used to manage the effects of aging on the intended functions of the components associated with environmental qualification TLAAs for the period of extended operation.

Disposition

The effects of aging on the intended functions of the environmentally qualified components will be adequately managed for the period of extended operation by the EQ Program.

A.1.3.6 Fatigue of Primary Containment, Attached Piping, and Components

The Primary Containment and attached piping and components susceptible to fatigue resulting from the effects of plant transients are evaluated below.

A.1.3.6.1 Primary Containment

The cycles used in the fatigue evaluation of the containment components are provided in FSAR Table 3A.4.1-3. No operating basis earthquakes have been experienced by Columbia through 2007, and the containment analysis for five operating basis earthquakes remains valid for 60 years of plant operation. The safe shutdown earthquake and post-loss of coolant accident (LOCA) chugging are once in a lifetime events and are not projected to occur during the extended period of operation. Safety relief valve actuations have been projected through 60 years of operation based on the number of actual events through 2007. The fatigue analyses performed using these events will remain valid for the period of extended operation.

As the cycles on which the containment fatigue analysis is based will not be exceeded for 60 years of operation, these analyses will remain valid for the period of extended operation.

Disposition

The TLAA associated with fatigue of the containment remains valid for the period of extended operation.

A.1.3.6.2 ASME Class MC Components

Class MC components include the primary containment vessel shell, large openings (equipment hatch, personnel hatches, and access hatch), penetrations (all except the large openings), and attachments (pipe supports in the wetwell, welding pads in the drywell, supports for the stabilizer truss, seal and shear lugs at the drywell floor, supports for the downcomer bracing system, pipe whip supports, radial beam supports, cap truss supports, catwalks, monorail, and platforms). The Class MC components were analyzed for fatigue using the transients listed in FSAR Table 3A.4.1-3. As these cycles will not be exceeded for 60 years of operation, the Class MC component fatigue analysis will remain valid for the period of extended operation.

A specific fatigue analysis was performed for the main steam penetrations using the transients listed in FSAR Table 3A.4.1-3. This analysis will remain valid for the period of extended operation as these cycles will not be exceeded for 60 years of operation.

The effects of power uprate on the containment system response were reviewed and determined to be negligible. The containment peak pressure values remain virtually unaffected by the power uprate and extended load line limit. The LOCA containment dynamic loads are not affected by power uprate, and safety relief valve containment loads will remain below their design allowables. (see FSAR Appendix 3A)

All events, including safety relief valve actuations, for 60 years of operation are projected to remain below the containment cyclic basis from FSAR Table 3A.4.1-3. Consequently, the analysis of the Class MC containment components remains valid for the period of extended operation.

Disposition

The TLAAs for fatigue of the ASME Class MC components remain valid through the end of the period of extended operation.

A.1.3.6.3 Downcomers

Although not an ASME Code requirement, a fatigue evaluation of the downcomers was performed. The fatigue evaluation of the downcomer lines in the wetwell air volume was based on the number of cycles presented in FSAR Table 3A.4.1-3. The maximum fatigue usage factor for the downcomers is provided in FSAR Table 3A.4.2-4 and FSAR Table 3A.4.2-5.

All events, including safety relief valve actuations, for 60 years of operation are projected to remain below the containment cyclic basis from FSAR Table 3A.4.1-3. Consequently, the analysis of the downcomers remains valid for the period of extended operation.

Disposition

The TLAA for fatigue of the downcomers remains valid through the end of the period of extended operation.

A.1.3.6.4 Safety Relief Valve Discharge Piping

Although not an ASME Code requirement, a fatigue evaluation of the safety relief valve (SRV) discharge piping was performed. The fatigue evaluation used the number of cycles as presented in FSAR Table 3A.4.1-3. The maximum fatigue usage factor for all 18 SRV discharge lines in the wetwell air volume is below the ASME allowable limits per FSAR Section 3A.4.2.4.6.

The SRV actuations for 60 years of operation are projected to remain below the containment cyclic basis from FSAR Table 3A.4.1-3. Consequently, the analysis of the SRV discharge piping remains valid for the period of extended operation.

Disposition

The TLAA for fatigue of the SRV discharge piping remains valid through the end of the period of extended operation.

A.1.3.6.5 Diaphragm Floor Seal

The diaphragm floor seal is located at the inside surface of the primary containment vessel periphery. It provides a flexible, pressure tight seal between the primary containment vessel and the diaphragm floor and is capable of accommodating differential thermal expansion between them.

The fatigue evaluation was performed using the cycles in FSAR Table 3A.4.1-3. The maximum cumulative usage factor is less than the fatigue limit per FSAR Table 3A.4.1-5. All events, including SRV actuations, for 60 years of operation are projected to remain below the containment cyclic basis from FSAR Table 3A.4.1-3. Consequently, the analysis of the diaphragm floor seal remains valid for the period of extended operation.

Disposition

The TLAA for fatigue of the containment diaphragm floor seal remains valid through the end of the period of extended operation.

A.1.3.6.6 ECCS Suction Strainers

The original Columbia ECCS suction strainers were replaced with a new strainer design constructed from cold-worked austenitic stainless steel. A linear elastic fracture mechanics analysis was performed to bound all the martensitic material in the suction strainer screens. A crack depth was assumed based on the depth of the Alpha Prime martensite in the strainer screen material.

Cyclic stresses were considered in the crack growth analysis of the suction strainers. The fatigue crack evaluation determined that the assumed cracks will not propagate to a critical size for the remaining life of the plant. The maximum computed stress intensity value (K) was less than that required to cause cracking in Alpha martensite formed in austenitic stainless steel.

The stress value conservatively included direct pressure and inertial components from SRV actuation, operating basis earthquake (OBE) loads, and SRV steam chugging. (See FSAR Table 3A.4.1-3.)

All events, including safety relief valve actuations, for 60 years of operation are projected to remain below the containment cyclic basis from FSAR Table 3A.4.1-3. Consequently, the analysis of the ECCS suction strainers remains valid for the period of extended operation.

Disposition

The TLAA for crack growth of the ECCS suction strainers remains valid through the end of the period of extended operation.

A.1.3.7 Other Plant-Specific Time-Limited Aging Analyses

The TLAAs that do not fit into any of the previous major categories are evaluated below.

A.1.3.7.1 Reactor Vessel Shell Indications

Two indications in the reactor vessel shell were identified using ultrasonic inspection methods during the 2005 inservice inspections. The indications were present in past inservice inspection examinations, but became rejectable under current ASME Section XI, IWB-3610 requirements. The rejected indications were evaluated and determined to be acceptable for continued service without repair, as reported to the NRC. The indications were evaluated per the guidelines of ASME Section XI, IWB-3610, which include acceptance criteria based on the applied stress intensity factors, using conservative assumptions in the applied stresses to determine the stress intensity factors for comparison to Code allowables.

This conservative evaluation calculated a fatigue crack growth at the end of 33.1 EFPY vessel service life that is insignificant in comparison to the bounding initial crack size. It also determined that the applied stress intensity factor is well below the allowable stress intensity factor.

The calculation is based on time-limited assumptions of neutron fluence and SRV blowdown cycles for 40 years. While it is not expected that the applied stress intensity factor will exceed the allowable fracture toughness during the period of extended operation, cracking near the subject reactor vessel welds is managed by the Inservice Inspection (ISI) Program.

Disposition

Cracking of the reactor vessel shell near welds BG and BM will be adequately managed through the period of extended operation by the Inservice Inspection (ISI) Program.

A.1.3.7.2 Sacrificial Shield Wall

FSAR Section 3.8.3.6 provides a value of neutron fluence for the outside face of the sacrificial shield wall that is based on 40 years of plant operation. Projections done for 60 years of operation, including increase in fluence due to power uprate, determined that the estimated neutron fluence on the sacrificial shield wall will remain below the threshold for neutron damage of concrete and reinforcing steel. Therefore, the sacrificial shield wall can be expected to perform its radiation shielding function through the period of extended operation.

Disposition

The TLAA associated with the sacrificial shield wall fluence has been projected to the end of the period of extended operation.

A.1.3.7.3 Main Steam Flow Restrictor Erosion Analyses

The main steam line flow restrictors are designed to limit coolant flow rate from the reactor vessel (before the MSIVs are closed) to less than 200 percent of normal flow in the event of a main steam line break outside the containment. Erosion of a flow restrictor is a safety concern since it could impair the ability of the flow restrictor to limit vessel blowdown following a main steam line break. Since erosion is a time-related phenomenon, the analysis for the effect it has on the flow restrictors over the life of the plant is a TLAA. Cast stainless steel (SA351, Type CF8) was selected for the steam flow restrictor material because it has excellent resistance to erosion-corrosion from high velocity steam.

The erosion of the main steam flow restrictors has been projected for the period of extended operation. The projection concludes that after 60 years of erosion on the main steam flow restrictors, the choked flow will still be less than 200 percent of normal flow. Therefore, the main steam flow restrictors will continue to perform their intended function and the existing accident radiological release analysis will remain valid for the period of extended operation.

Disposition

The TLAA for erosion of the main steam line flow restrictors has been projected to the end of the period of extended operation.

A.1.4 References

A.1.4-1 BWROG Report GE-NE-523-A71-0594-A, Rev 1, “Alternate BWR Feedwater Nozzle Inspection Requirements,” May 2000

A.1.4-2 EPRI Report No. 1011838, “Recommendations for An Effective Flow Accelerated Corrosion Program (NSAC-202L-R3),” May 2006

A.1.5 License Renewal Commitment List

A listing of commitments identified in association with Columbia license renewal is provided in Table A-1. These commitments will be tracked within the Columbia regulatory commitment management program. Any other actions discussed in the LRA represent intended or planned actions. They are described to the NRC for information and are not regulatory commitments.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
1) Aboveground Steel Tanks Inspection	The Aboveground Steel Tanks Inspection is a new activity. The Aboveground Steel Tanks Inspection detects and characterizes the conditions on the bottom surfaces of the condensate storage tanks. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred in inaccessible areas.	A.1.2.1	Within the 10-year period prior to the period of extended operation.
2) Air Quality Sampling Program	The Air Quality Sampling Program is an existing program that will be continued for the period of extended operation.	A.1.2.2	Ongoing
3) Appendix J Program	The Appendix J Program is an existing program that will be continued for the period of extended operation.	A.1.2.3	Ongoing
4) Bolting Integrity Program	The Bolting Integrity Program is an existing program that will be continued for the period of extended operation.	A.1.2.4	Ongoing

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
5) Buried Piping and Tanks Inspection Program	The Buried Piping and Tanks Inspection Program is an existing program that will be continued for the period of extended operation, with the following enhancements: • Revise the site program document to include the buried portions of the Radwaste Building Outside Air (WOA) piping. • Require that an inspection of a representative sample of buried piping be performed within the 10-year period prior to entering the period of extended operation (i.e., between year 30 and year 40). • Require an additional inspection of a representative sample of buried piping be performed within 10 years after entering the period of extended operation (i.e., between year 40 and year 50).	A.1.2.5	Enhancement prior to the period of extended operation. Then ongoing.
6) BWR Feedwater Nozzle Program	The BWR Feedwater Nozzle Program is an existing program that will be continued for the period of extended operation.	A.1.2.6	Ongoing
7) BWR Penetrations Program	The BWR Penetrations Program is an existing program that will be continued for the period of extended operation.	A.1.2.7	Ongoing
8) BWR Stress Corrosion Cracking Program	The BWR Stress Corrosion Cracking Program is an existing program that will be continued for the period of extended operation.	A.1.2.8	Ongoing

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
9) BWR Vessel ID Attachment Welds Program	The BWR Vessel ID Attachment Welds Program is an existing program that will be continued for the period of extended operation.	A.1.2.9	Ongoing
10) BWR Vessel Internals Program	The BWR Vessel Internals Program is an existing program that will be continued for the period of extended operation.	A.1.2.10	Ongoing
11) BWR Water Chemistry Program	The BWR Water Chemistry Program is an existing program that will be continued for the period of extended operation.	A.1.2.11	Ongoing
12) Chemistry Program Effectiveness Inspection	The Chemistry Program Effectiveness Inspection is a new activity. The Chemistry Program Effectiveness Inspection detects and characterizes the condition of materials in representative low flow and stagnant areas of systems with water chemistry controlled by the BWR Water Chemistry Program or the Closed Cooling Water Chemistry Program, and with fuel oil chemistry controlled by the Fuel Oil Chemistry Program . The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.12	Within the 10-year period prior to the period of extended operation.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
13) Closed Cooling Water Chemistry Program	The Closed Cooling Water Chemistry Program is an existing program that will be continued for the period of extended operation, with the following enhancement: • Ensure that at least one additional Reactor Closed Cooling Water corrosion rate measurement is performed and evaluated prior to entering the period of extended operation to provide direct information as to the effectiveness of the chemical treatments. If necessary, based on the results, establish a frequency for subsequent measurements.	A.1.2.13	Enhancement prior to the period of extended operation. Then ongoing.
14) Cooling Units Inspection	The Cooling Units Inspection is a new activity. The Cooling Units Inspection detects and characterizes the material condition of cooling unit components that are exposed to condensation. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.14	Within the 10-year period prior to the period of extended operation.
15) CRDRL Nozzle Program	The CRDRL Nozzle Program is an existing program that will be continued for the period of extended operation.	A.1.2.15	Ongoing

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
16) Diesel Starting Air Inspection	The Diesel Starting Air Inspection is a new activity. The Diesel Starting Air Inspection detects and characterizes the condition of materials for the DSA System air dryers and downstream piping and components (excluding the DSA System air receivers). The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.16	Within the 10-year period prior to the period of extended operation.
17) Diesel Systems Inspection	The Diesel Systems Inspection is a new activity. The Diesel Systems Inspection detects and characterizes the condition of materials for the interior of the exhaust piping for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust System, including the loop seal drains from the exhaust piping, and the drain pans and drain piping associated with air-handling units of the Diesel Building HVAC systems. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.17	Within the 10-year period prior to the period of extended operation.
18) Diesel-Driven Fire Pumps Inspection	The Diesel-Driven Fire Pumps Inspection is a new activity. The Diesel-Driven Fire Pumps Inspection detects and characterizes the material condition of the interior of the Fire Protection System diesel engine exhaust piping, and of Fire Protection System diesel heat exchangers exposed to a raw water environment. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.18	Within the 10-year period prior to the period of extended operation.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
19) Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program	The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program is a new program. The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program is an inspection program that detects degradation of electrical cables and connections that are not environmentally qualified and are within the scope of license renewal. The program provides for the periodic visual inspection of accessible, non-environmentally qualified cables and connections in order to determine if age-related degradation is occurring, particularly in plant areas with adverse localized environments.	A.1.2.19	Implementation prior to the period of extended operation. Then ongoing.
20) Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program	The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program is a new program. The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program is a monitoring program that detects degradation of electrical cables and connections that are not environmentally qualified and used in circuits with sensitive, low-current applications. The program provides for a review of calibration records for low-current instruments, in order to detect and identify degradation of the cable system insulation resistance. The program retains the option to perform direct cable testing.	A.1.2.20	Implementation prior to the period of extended operation. Then ongoing.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
21) Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection	The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection is a new activity. The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection detects and characterizes the material condition of metallic electrical connections within the scope of license renewal. The inspection uses thermography (augmented by contact resistance testing) to detect loose or degraded connections that lead to increased resistance for a representative sample of metallic electrical connections in various plant locations.	A.1.2.21	Within the 10-year period prior to the period of extended operation.
22) EQ Program	The EQ Program is an existing program that will be continued for the period of extended operation.	A.1.2.22 A.1.3.5	Ongoing

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
23) External Surfaces Monitoring Program	The External Surfaces Monitoring Program is an existing program that will be continued for the period of extended operation, with the following enhancements: • Add aluminum, copper alloy, copper alloy >15 % Zn, gray cast iron, stainless steel (including CASS), and elastomers to the scope of the program. • Add cracking as an aging effect for aluminum and stainless steel components. • Add visual (VT-1 or equivalent) or volumetric examination techniques to detect cracking. • Add hardening and loss of strength as aging effects for elastomer-based mechanical sealants and flexible connections in HVAC systems. • Add physical examination techniques in addition to visual inspection to detect hardening and loss of strength for elastomer-based mechanical sealants and flexible connections in HVAC systems.	A.1.2.23	Enhancement prior to the period of extended operation. Then ongoing.
24) Fatigue Monitoring Program	The Fatigue Monitoring Program is an existing program that will be continued for the period of extended operation, with the following enhancements:	A.1.2.24 A.1.3.2 A.1.3.4	Enhancement prior to the period of extended operation. Then ongoing.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
24) Fatigue Monitoring Program (cont'd)	• Columbia has analyzed the effects of the reactor coolant environment on fatigue for the six locations recommended by NUREG\CR-6260. These analyses are based on the projected cycles for 60 years of operation (plus some conservatism) rather than the original design cycles in FSAR Table 3.9-1. The Fatigue Monitoring Program will be enhanced to ensure that action will be taken when the lowest number of analyzed cycles is approached. • For each location that may exceed a CUF of 1.0 (due to projected cycles exceeding analyzed, or due to as-yet undiscovered industry issues), the Fatigue Monitoring Program will implement one or more of the following: (1) Refine the fatigue analyses to determine valid CUFs less than 1.0, (2) Manage the effects of aging due to fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC, or (3) Repair or replace the affected locations before exceeding a CUF of 1.0. • Correlate information relative to fatigue monitoring and provide more definitive verification that the transients monitored and their limits are consistent with or bound the FSAR and the supporting fatigue analyses, including the environmentally-assisted fatigue analyses.		

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
25) Fire Protection Program	The Fire Protection Program is an existing program that will be continued for the period of extended operation.	A.1.2.25	Ongoing
26) Fire Water Program	The Fire Water Program is an existing program that will be continued for the period of extended operation, with the following enhancements: • Perform either ultrasonic testing or internal visual inspection of representative portions of above ground fire protection piping that are exposed to water, but do not normally experience flow, after the issuance of the renewed license, but prior to the end of the current operating term and at reasonable intervals thereafter, based on engineering review of the results. • Either replace sprinkler heads that have been in place for 50 years or submit representative samples to a recognized laboratory for field service testing in accordance with NFPA 25 recommendations. Perform subsequent replacement or field service testing of representative samples at 10-year intervals thereafter or until there are no sprinkler heads installed that will reach 50 years of service life during the period of extended operation. • Perform hardness testing (or equivalent) of the sprinkler heads as part of their NFPA sampling, to determine whether loss of material due to selective leaching is occurring.	A.1.2.26	Enhancement prior to the period of extended operation. Then ongoing.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
27) Flexible Connection Inspection	The Flexible Connection Inspection is a new activity. The Flexible Connection Inspection detects and characterizes the material condition of elastomer components exposed to treated water, dried air, gas, and indoor air environments. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.27	Within the 10-year period prior to the period of extended operation.
28) Flow-Accelerated Corrosion (FAC) Program	The Flow-Accelerated Corrosion (FAC) Program is an existing program that will be continued for the period of extended operation, with the following enhancements: • Add the Containment Nitrogen System components supplied with steam from the Auxiliary Steam System to the scope of the program. • Add gray cast iron as a material identified as susceptible to FAC.	A.1.2.28	Enhancement prior to the period of extended operation. Then ongoing.
29) Fuel Oil Chemistry Program	The Fuel Oil Chemistry Program is an existing program that will be continued for the period of extended operation.	A.1.2.29	Ongoing

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
30) Heat Exchangers Inspection	The Heat Exchangers Inspection is a new activity. The Heat Exchangers Inspection detects and characterizes the surface conditions with respect to fouling of heat exchangers and coolers that are in the scope of the inspection and exposed to treated water, closed cooling water, or indoor air. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.30	Within the 10-year period prior to the period of extended operation.
31) High-Voltage Porcelain Insulators Aging Management Program	The High-Voltage Porcelain Insulators Aging Management Program is an existing program that will be continued for the period of extended operation.	A.1.2.31	Ongoing

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
32) Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program	The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program is a new program. The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program manages the aging of inaccessible medium-voltage cables that are not environmentally qualified and are within the scope of license renewal. The program provides for testing to identify the conditions of the conductor insulation, and also provides for periodic inspection and drainage (if necessary) of electrical manholes. The frequency of the cable testing portion of the program will be once every 10 years, with the first test to be performed prior to the period of extended operation. The frequency of the manhole inspections will be at least once every two years, with the first inspections to be performed prior to the period of extended operation.	A.1.2.32	Implementation prior to the period of extended operation. Then ongoing.
33) Inservice Inspection (ISI) Program	The Inservice Inspection (ISI) Program is an existing program that will be continued for the period of extended operation.	A.1.2.33	Ongoing
34) Inservice Inspection (ISI) Program – IWE	The Inservice Inspection (ISI) Program – IWE is an existing program that will be continued for the period of extended operation.	A.1.2.34	Ongoing
35) Inservice Inspection (ISI) Program – IWF	The Inservice Inspection (ISI) Program - IWF is an existing program that will be continued for the period of extended operation.	A.1.2.35	Ongoing

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
36) Lubricating Oil Analysis Program	The Lubricating Oil Analysis Program is an existing program that will be continued for the period of extended operation, with the following enhancements: • Include the following Fire Protection System components that are exposed to lubricating oil within the scope of the program: (1) fire protection diesel engine heat exchangers (lube oil coolers), (2) fire protection diesel engine lube oil piping, and (3) fire protection diesel engine lube oil pump casings.	A.1.2.36	Enhancement prior to the period of extended operation. Then ongoing.
37) Lubricating Oil Inspection	The Lubricating Oil Inspection is a new activity. The Lubricating Oil Inspection detects and characterizes the condition of materials in systems and components for which the Lubricating Oil Analysis Program is credited with aging management. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.37	Within the 10-year period prior to the period of extended operation.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
38) Masonry Wall Inspection	The Masonry Wall Inspection is an existing program that will be continued for the period of extended operation, with the following enhancements: • Specify that for each masonry wall, the extent of observed masonry cracking or degradation of steel edge supports and bracing are evaluated to ensure that the current evaluation basis is still valid. Corrective action is required if the extent of masonry cracking or steel degradation is sufficient to invalidate the evaluation basis. An option is to develop a new evaluation basis that accounts for the degraded condition of the wall (i.e., acceptance by further evaluation).	A.1.2.38	Enhancement prior to the period of extended operation. Then going.
39) Material Handling System Inspection Program	The Material Handling System Inspection Program is an existing program that will be continued for the period of extended operation, with the following enhancement: • Ensure jib cranes and electrically operated hoists are visually inspected for corrosion.	A.1.2.39	Enhancement prior to the period of extended operation. Then ongoing.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
40) Metal-Enclosed Bus Program	The Metal-Enclosed Bus Program is a new program. The Metal-Enclosed Bus Program is an inspection program that detects degradation of metal-enclosed bus within the scope of license renewal. The program provides for the visual inspection of interior sections of bus, and an inspection of the elastomeric seals at the joints of the duct sections. The program also makes provision for thermographic inspection of bus bolted connections. The thermography portion of the program will be performed once every 10 years, with the initial inspections to be performed prior to the period of extended operation. The visual inspection portion of the program will also be performed once every 10 years, with the first inspections to be performed prior to the period of extended operation.	A.1.2.40	Implementation prior to the period of extended operation. Then ongoing.
41) Monitoring and Collection Systems Inspection	The Monitoring and Collection Systems Inspection is a new activity. The Monitoring and Collection Systems Inspection detects and characterizes the condition of materials at the internal surfaces of subject mechanical components that are exposed to equipment or area drainage water and other potential contaminants and fluids. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.41	Within the 10-year period prior to the period of extended operation.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
42) Open-Cycle Cooling Water Program	The Open-Cycle Cooling Water Program is an existing program that will be continued for the period of extended operation, with the following enhancements: • Address loss of material due to cavitation erosion (for the Standby Service Water (SW), Circulating Water (CW), Plant Service Water (TSW), and Tower Make-Up (TMU) systems) with activities such as opportunistic inspections of portions of the systems that have had indications of cavitation erosion in the past. • Include the non-safety related components within the license renewal scope in the SW, CW, TSW, and TMU systems, and the non-safety related components served by or connected to the TSW System that are in the Process Sampling, Process Sampling Radioactive, Radwaste Building Mixed Air, Radwaste Building Return Air, Reactor Building Return Air, and Reactor Closed Cooling Water systems.	A.1.2.42	Enhancement prior to the period of extended operation. Then ongoing.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
43) Potable Water Monitoring Program	The Potable Water Monitoring Program is an existing program that will be continued for the period of extended operation, with the following enhancements: • Include periodic inspection activities. Based on operating experience, it is necessary that inspections be conducted at least once every five years, and include components of the Potable Cold Water and Potable Hot Water systems that are located in the Reactor Building, and components associated with the Reactor Building Outside Air (ROA) air washer (ROA-AW-1), including the air washer housing. At least one inspection will be conducted within the 10-year period prior to the period of extended operation.	A.1.2.43	Enhancement and inspection within the 10-year period prior to the period of extended operation. Then ongoing.
44) Preventive Maintenance – RCIC Turbine Casing	The Preventive Maintenance – RCIC Turbine Casing is an existing program that will be continued for the period of extended operation.	A.1.2.44	Ongoing
45) Reactor Head Closure Studs Program	The Reactor Head Closure Studs Program is an existing program that will be continued for the period of extended operation.	A.1.2.45	Ongoing
46) Reactor Vessel Surveillance Program	The Reactor Vessel Surveillance Program is an existing program that will be continued for the period of extended operation.	A.1.2.46	Ongoing

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
47) Selective Leaching Inspection	The Selective Leaching Inspection is a new activity. The Selective Leaching Inspection detects and characterizes the conditions on internal and external surfaces of subject components exposed to raw water, treated water, fuel oil, soil, and moist air (including condensation) environments. The inspection provides direct evidence through a combination of visual examination and hardness testing, or NRC-approved alternative, as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.47	Within the 10-year period prior to the period of extended operation.
48) Service Air System Inspection	The Service Air System Inspection is a new activity. The Service Air System Inspection detects and characterizes the material condition of steel piping and valve bodies exposed to an “air (internal)” (i.e., compressed air) environment within the license renewal boundary of the Service Air System. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.48	Within the 10-year period prior to the period of extended operation.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
49) Small Bore Class 1 Piping Inspection	The Small Bore Class 1 Piping Inspection is a new activity. The Small Bore Class 1 Piping Inspection will detect and characterize the conditions on the internal surfaces of small bore Class 1 piping components that are exposed to reactor coolant. The Small Bore Class 1 Piping Inspection will provide physical evidence as to whether, and to what extent, the relevant effects of aging have occurred. The Small Bore Class 1 Piping Inspection includes visual and volumetric inspection of a representative sample of small bore Class 1 piping components. The inspection provides additional assurance that cracking of small bore Class 1 piping is not occurring or is insignificant, such that an aging management program is not warranted during the period of extended operation. This one-time inspection is appropriate as Columbia has not experienced cracking of small bore Class 1 piping from stress corrosion or thermal and mechanical loading. Should evidence of significant aging be revealed by the one-time inspection or through plant operating experience, periodic inspection will be considered as a plant-specific aging management program.	A.1.2.49	Within the portion of the fourth 10-year ISI interval that occurs prior to the period of extended operation.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
50) Structures Monitoring Program	The Structures Monitoring Program is an existing program that will be continued for the period of extended operation, with the following enhancements: • Include and list the structures within the scope of license renewal that credit the Structures Monitoring Program for aging management. • Specify that if a below grade structural wall or structural component becomes accessible through excavation; a follow-up action is initiated for the responsible engineer to inspect the exposed surfaces for age-related degradation prior to backfilling. • Identify that the term "structural component" for inspection includes component types that credit the Structures Monitoring Program for aging management. • Include the potential degradation mechanism checklist in the procedural documents. The checklist also requires enhancement to include aging effect terminology (e.g., loss of material, cracking, change in material properties, and loss of form).	A.1.2.50	Enhancement prior to the period of extended operation. Then ongoing.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
50) Structures Monitoring Program (cont'd)	• Specify that the responsible engineer shall review site groundwater and raw water testing results for pH, chlorides, and sulfates prior to inspection to validate that the below-grade or raw water environments remain non-aggressive during the period of extended operation. Chemistry data shall be obtained from Columbia's chemistry and environmental departments. Groundwater chemistry data shall be collected at least once every four years. The time of data collection shall be staggered from year to year (summer-winter-summer) to account for seasonal variations in the environment.		
51) Supplemental Piping/Tank Inspection	The Supplemental Piping/Tank Inspection is a new activity. The Supplemental Piping/Tank Inspection detects and characterizes the material condition of steel, gray cast iron, and stainless steel components exposed to moist air environments. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.51	Within the 10-year period prior to the period of extended operation.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
52) Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program	The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program. The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will manage loss of fracture toughness due to thermal aging and neutron irradiation embrittlement of CASS reactor vessel internals. The program includes: (a) identification of susceptible components determined to be limiting from the standpoint of thermal aging or neutron irradiation embrittlement (neutron fluence), (b) a component-specific evaluation to determine each identified component's susceptibility to loss of fracture toughness, and (c) a supplemental examination of any component not eliminated by the component-specific evaluation.	A.1.2.52	Implementation prior to the period of extended operation. Then ongoing.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
53) Water Control Structures Inspection	The Water Control Structures Inspection is an existing program that will be continued for the period of extended operation, with the following enhancements: • Include and list the water control structures within the scope of license renewal. Include the RG 1.127 Revision 1 inspection elements for the water control structures, including submerged surfaces. Ensure descriptions of concrete conditions conform with the appendix to the American Concrete Institute (ACI) publication, ACI 201, "Guide for Making a Condition Survey of Concrete in Service." Add a recommendation to use photographs for comparison of previous and present conditions. Add a requirement for the documentation of new or progressive problems as a part of the inspection program.	A.1.2.53	Enhancement prior to the period of extended operation. Then ongoing.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
54) Pressure-Temperature Limits	The Columbia P-T limit curves were revised in 2005 to include the effects of power uprate to 3486 MWt. The P-T limits are valid for 33.1 EFPY through the end of the currently licensed period. P-T limits for the period of extended operation will be calculated using the most accurate fluence projections available at the time of the recalculation. The projections may be adjusted if there are changes in core design or if additional surveillance capsule results show the need for an adjustment. The projected ART for the period of extended operation gives confidence that future P-T curves will provide adequate operating margin. License amendment requests to revise the P-T limits will be submitted to the NRC for approval, when necessary to comply with 10 CFR 50 Appendix G, as part of the Reactor Vessel Surveillance Program.	A.1.3.1.4	Ongoing
55) Incorporate FSAR Supplement	Energy Northwest will incorporate the FSAR Supplement into the Columbia FSAR as required by 10 CFR 54.21(d).	A.1 A.1.1	Following issuance of the renewed operating license.
56) Operational Quality Assurance Program Description	The elements of corrective actions, confirmation process, and administrative controls in the OQAPD will be applied to required aging management programs for both safety-related and non-safety related structures and components determined to require aging management during the period of extended operation.	A.1.2	Prior to the period of extended operation.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
57) License Renewal Commitment List	The commitments identified in association with Columbia license renewal will be tracked within the Columbia regulatory commitment management program.	A.1.5	Upon submittal of the license renewal application to the NRC.
58) BWRVIP-42-A, AAI#5	In accordance with the BWR Vessel Internals Program, Columbia will implement the additional inspection requirements of BWRVIP-42-A once those requirements are approved by the NRC staff.	LRA Appendix C	Based on NRC schedule.
59) BWRVIP-116	Energy Northwest will submit a licensing basis change request to implement the BWRVIP ISP(E) at least two years prior to the period of extended operation. Columbia will implement the ISP(E) as amended by the BWRVIP letter of January 11, 2005, including the new capsule test schedule in Table 1 of that letter.	LRA Appendix C	Two years prior to the period of extended operation.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
60) BWRVIP-116	Implementation of the BWRVIP ISP(E) for Columbia will include the following details in support of the contingency plan: (1) Energy Northwest will include the requirement to keep all tested material (irradiated or unirradiated) for possible future reconstitution and testing. (2) The Columbia site procedure, as modified, will continue to require any capsules removed from the reactor vessel to be stored in a manner that would support future re-insertion of these capsules in the reactor vessel. (3) Energy Northwest will notify the BWRVIP prior to any change in the storage of on-site materials. NRC approval will be obtained prior to any change in the storage of surveillance materials that would affect the potential use of the materials under the contingency plan.	LRA Appendix C	On-going

APPENDIX B

AGING MANAGEMENT PROGRAMS

[This page intentionally blank]

APPENDIX B
TABLE OF CONTENTS

APPENDIX B

TABLE OF CONTENTS

APPENDIX B
TABLE OF CONTENTS

[This page intentionally blank]

B.0 AGING MANAGEMENT PROGRAMS

B.1 INTRODUCTION

B.1.1 Overview

License renewal aging management program descriptions are provided in this appendix for each program credited for managing aging effects based upon the aging management review results provided in Sections 3.1 through 3.6 of this Application.

Each aging management program described in this appendix is evaluated on the basis of 10 program elements in accordance with the guidance in Appendix A.1, Section A.1.2.3 of NUREG-1800, the Standard Review Plan for License Renewal (SRP-LR).

B.1.2 Method of Discussion

For those existing AMPs that are comparable to the programs described in Sections X and XI of NUREG-1801, the "Generic Aging Lessons Learned (GALL) Report," the program evaluation is presented in the following summary format:

- **Program Description** – An abstract of the overall program is provided.
- **NUREG-1801 Consistency** – A statement is made regarding consistency between the Columbia program and the corresponding NUREG-1801 program.
- **Exceptions to NUREG-1801** – Exceptions to NUREG-1801 programs are identified when elements of the Columbia program are different from the NUREG-1801 program elements or when elements of the NUREG-1801 program are not applicable to Columbia. Each exception is listed along with the affected element. A justification is provided for each exception.
- **Required Enhancements** – Enhancements to existing programs necessary to ensure consistency with NUREG-1801 or to expand the scope of the program for license renewal are identified. Each enhancement is listed along with the affected program element and a proposed schedule for completion of the enhancement.
- **Operating Experience** – Discussion of operating experience information specific to the program is provided.
- **Conclusion** – A conclusion section provides a statement of reasonable assurance that the program is effective, or will be effective, once enhanced or developed.

For those programs that are either new or plant-specific, the above format is followed along with the additional provision of a discussion of each of the 10 elements associated with the program.

B.1.3 Quality Assurance Program and Administrative Controls

Three elements of an effective aging management program that are common to each of the aging management programs are corrective actions, confirmation process, and administrative controls. These elements are included in the Operational Quality Assurance Program Description (OQAPD) for Columbia, which implements the requirements of 10 CFR 50 Appendix B. The OQAPD is described in FSAR Sections 3.1.2.1.1, 13.4, and 17.2.

Prior to the period of extended operation, the elements of corrective actions, confirmation process, and administrative controls in the OQAPD will be applied to required aging management programs for both safety-related and NSR structures and components determined to require aging management during the period of extended operation. The corrective actions, confirmation process, and administrative controls in the OQAPD, to be applied to the credited aging management programs and activities for the structures and components determined to require aging management, are consistent with the related discussions in the Appendix on Quality Assurance for Aging Management Programs in NUREG-1801, Volume 2.

The elements of corrective actions, confirmation process, and administrative controls of the OQAPD are described in the sections below, including a general comparison to the associated elements of the corresponding NUREG-1801 aging management programs (AMPs), which indicate that the "staff finds the requirements of 10 CFR Part 50, Appendix B acceptable to address the corrective actions (and confirmation process)."

Corrective Actions:

Corrective actions are implemented through the site corrective action program, which includes the initiation, processing, and evaluation of condition reports, that satisfies the requirements of 10 CFR 50, Appendix B, Criterion XVI. Conditions adverse to quality, an all inclusive term used in reference to failures, malfunctions, deficiencies, defective items, and non-conformances are identified, reported to management, and corrected. In the case of significant conditions adverse to quality, measures are implemented to ensure that the root cause is determined and that corrective actions are taken to preclude recurrence.

The corrective action program is the subject of periodic NRC examination and Columbia self-assessment and audit. In general, problems are effectively identified, evaluated and prioritized, and effective corrective actions implemented for conditions adverse to quality. Some program shortfalls have been identified, but corresponding process improvement plans have been developed and implemented. The current program is, therefore, adequate for aging management considerations.

Confirmation Process:

The focus of the confirmation process is on the follow-up actions taken to verify effective implementation of corrective actions and preclude repetition of significant conditions adverse to quality. The corrective action program includes the requirement that measures be taken to preclude repetition of significant conditions adverse to quality. These measures include actions to verify effective implementation of proposed corrective actions. The confirmation process is part of the corrective action program and, for significant conditions adverse to quality, includes:

- reviews to assure proposed actions are adequate,
- tracking and reporting of open corrective actions,
- Root Cause and Apparent-Common Cause evaluations, and
- reviews of corrective action effectiveness.

Effectiveness reviews are conducted as part of the corrective action process to ensure that all corrective actions have been completed and to identify any repetition of the event. The corrective action process is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of a follow-up condition report.

Administrative Controls:

Administrative controls that govern aging management activities are established within the document control procedures that implement: (1) industry standards related to administrative controls and quality assurance for the operational phase of nuclear power plants, and (2) the requirements of 10 CFR 50, Appendix B, Criterion VI.

Plant policies, directives, and procedures are written and controlled to specify and manage various activities, particularly those related to compliance with 10 CFR 50, Appendix B. The phrase ”administrative control” refers to the adherence to the policies, directives, and procedures, and includes the formal review and approval process that the plant policies, directives, and procedures undergo as they are issued (and subsequently revised). The individual documents (i.e., the plant policies, directives, and procedures), in conjunction with the plant’s quality assurance program documents, provide the overall administrative framework to ensure regulatory requirements are met.

B.1.4 Operating Experience

Operating experience for existing Columbia plant programs and activities was reviewed as an input to the aging management program evaluations. The operating experience review demonstrates the effectiveness of the plant programs and activities that are credited with aging management for the period of extended operation.

Plant procedures require that the discovery of conditions adverse to quality be documented in accordance with the corrective action program. A review of plant records for the most recent seven-year period (January 2001 through July 2008) was performed in order to identify age-related issues of degradation related to current plant operation. The scope of the review included reports generated under the corrective action program and licensee event reports. These records provide documentation of situations where systems, structures, and components exhibit conditions adverse to quality, including age-related degradation. Keywords related to aging and degradation were used to search the records.

The operating experience review provides the basis for the determination that existing programs are either effective or require enhancement; that one-time inspections are appropriate to verify that either aging is not occurring or that aging is being effectively managed by an existing program; or that a new program is required to be established to manage the effects of aging.

The operating experience review included consideration of the results of programmatic assessments performed by Columbia and of those performed by outside agencies, including the NRC. Past corrective actions resulting in program enhancements are included in the evaluation of program effectiveness. Industry operating experience was considered specifically for new programs with no plant-specific operating experience or when industry events were significant for existing programs. The operating experience review provides objective evidence that the effects of aging will be managed for the period of extended operation.

B.1.5 Aging Management Programs

Table B-1 provides a listing of the NUREG-1801 aging management programs and the corresponding aging management programs for Columbia. Table B-2 provides a summary of the aging management programs for Columbia with respect to consistency with NUREG-1801 aging management programs. Table B-2 also provides information on whether programs are existing or new, whether enhancements are required, and whether the programs are plant-specific. Each aging management program credited for license renewal is addressed in Section B.2.

B.2 AGING MANAGEMENT PROGRAMS

The correlation between NUREG-1801 programs and Columbia aging management programs is shown in the following table. The table is organized by the NUREG-1801 program number, first for Chapter XI, then for Chapter X, and finally for plant-specific programs.

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs

Number	NUREG-1801 Program	Corresponding Columbia AMP
NUREG-1801 Chapter XI		
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	Inservice Inspection (ISI) Program See Section B.2.33.
XI.M2	Water Chemistry	BWR Water Chemistry Program See Section B.2.11.
XI.M3	Reactor Head Closure Studs	Reactor Head Closure Studs Program See Section B.2.45.
XI.M4	BWR Vessel ID Attachment Welds	BWR Vessel ID Attachment Welds Program See Section B.2.9.
XI.M5	BWR Feedwater Nozzle	BWR Feedwater Nozzle Program See Section B.2.6.
XI.M6	BWR Control Rod Drive Return Line Nozzle	CRDRL Nozzle Program See Section B.2.15.
XI.M7	BWR Stress Corrosion Cracking	BWR Stress Corrosion Cracking Program See Section B.2.8.
XI.M8	BWR Penetrations	BWR Penetrations Program See Section B.2.7.
XI.M9	BWR Vessel Internals	BWR Vessel Internals Program See Section B.2.10.

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.M10	Boric Acid Corrosion	Not Applicable. Columbia is a BWR and does not use boric acid in any systems. The Standby Liquid Control System uses a sodium pentaborate solution (a mixture of boric acid and borax) that is not aggressive to metals.
XI.M11A	Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	Not Applicable. This program is applicable to PWR plants, Columbia is a BWR.
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Not credited for aging management. The Inservice Inspection (ISI) Program (See Section B.2.33) or the Small Bore Class 1 Piping Inspection (See Section B.2.49) is credited for pump casings and valve bodies.
XI.M13	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program See Section B.2.52.
XI.M14	Loose Parts Monitoring	Not credited for aging management. The Columbia loose parts detection system has been deactivated and spared in-place, as described in FSAR Section 7.7.1.12.
XI.M15	Neutron Noise Monitoring	Not Applicable. This program is applicable to PWR plants, Columbia is a BWR.
XI.M16	PWR Vessel Internals	Not Applicable. This program is applicable to PWR plants, Columbia is a BWR.
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion (FAC) Program See Section B.2.28.
XI.M18	Bolting Integrity	Bolting Integrity Program See Section B.2.4.
XI.M19	Steam Generator Tube Integrity	Not Applicable. Columbia is a BWR design that does not utilize steam generators.

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.M20	Open-Cycle Cooling Water System	Open-Cycle Cooling Water Program See Section B.2.42.
XI.M21	Closed-Cycle Cooling Water System	Closed Cooling Water Chemistry Program See Section B.2.13.
XI.M22	Boraflex Monitoring	Not Applicable. Spent fuel racks at Columbia use Boron Carbide plates as the neutron absorber (rather than Boraflex), as described in FSAR Section 9.1.2.2.1.
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Material Handling System Inspection Program See Section B.2.39.
XI.M24	Compressed Air Monitoring	Not credited for aging management. Operating experience shows that the air and gas is dry for most systems except in certain locations for which the plant-specific Air Quality Sampling Program is credited (See Section B.2.2).
XI.M25	BWR Reactor Water Cleanup System	Not credited for aging management. Cracking of the stainless steel RWCU piping components within the augmented ISI boundary is managed by the BWR Stress Corrosion Cracking Program (See Section B.2.8).
XI.M26	Fire Protection	Fire Protection Program See Section B.2.25.
XI.M27	Fire Water System	Fire Water Program See Section B.2.26.
XI.M28	Buried Piping and Tanks Surveillance	Not credited for aging management. The alternate XI.M34 option is credited for aging management. See Section B.2.5 for the alternate Buried Piping and Tanks Inspection Program.
XI.M29	Aboveground Steel Tanks	Aboveground Steel Tanks Inspection See Section B.2.1.
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry Program See Section B.2.29.

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program See Section B.2.46.
XI.M32	One-Time Inspection	Chemistry Program Effectiveness Inspection See Section B.2.12. Cooling Units Inspection See Section B.2.14. Diesel-Driven Fire Pumps Inspection See Section B.2.18. Diesel Starting Air Inspection See Section B.2.16. Diesel Systems Inspection See Section B.2.17. Flexible Connection Inspection See Section B.2.27. Heat Exchangers Inspection See Section B.2.30. Lubricating Oil Inspection See Section B.2.37. Monitoring and Collection Systems Inspection See Section B.2.41. Service Air System Inspection See Section B.2.48. Supplemental Piping/Tank Inspection See Section B.2.51.
XI.M33	Selective Leaching of Materials	Selective Leaching Inspection See Section B.2.47.
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program See Section B.2.5.
XI.M35	One-time Inspection of ASME Code Class 1 Small-Bore Piping	Small Bore Class 1 Piping Inspection See Section B.2.49.
XI.M36	External Surfaces Monitoring	External Surfaces Monitoring Program See Section B.2.23.

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.M37	Flux Thimble Tube Inspection	Not Applicable. Columbia is a BWR design that does not utilize flux thimbles.
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Not credited for aging management. The External Surfaces Monitoring Program (See Section B.2.23) and Preventive Maintenance – RCIC Turbine Casing (See Section B.2.44) are credited instead for aging management of internal surfaces. Confirmation that aging is not occurring on internal surfaces is provided by the Cooling Units Inspection (See Section B.2.14), the Monitoring and Collection Systems Inspection (See Section B.2.41), and the Supplemental Piping/Tank Inspection (See Section B.2.51).
XI.M39	Lubricating Oil Analysis	Lubricating Oil Analysis Program See Section B.2.36.
XI.S1	ASME Section XI, Subsection IWE	Inservice Inspection (ISI) Program – IWE See Section B.2.34.
XI.S2	ASME Section XI, Subsection IWL	Not Applicable. Columbia has a General Electric Mark II steel containment, as described in FSAR Section 3.8.2.1.
XI.S3	ASME Section XI, Subsection IWF	Inservice Inspection (ISI) Program – IWF See Section B.2.35.
XI.S4	10 CFR Part 50, Appendix J	Appendix J Program See Section B.2.3.
XI.S5	Masonry Wall Program	Masonry Wall Inspection See Section B.2.38.
XI.S6	Structures Monitoring Program	Structures Monitoring Program See Section B.2.50.
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Water Control Structures Inspection See Section B.2.53.

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.S8	Protective Coating Monitoring and Maintenance Program	Not credited for aging management. Columbia does not credit coatings inside the containment to manage the effects of aging for structures and components or to ensure that the intended functions of coated structures and components are maintained. Therefore, these coatings do not have an intended function and do not require aging management for license renewal.
XI.E1	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program See Section B.2.19.
XI.E2	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program See Section B.2.20.
XI.E3	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program See Section B.2.32.
XI.E4	Metal-Enclosed Bus	Metal-Enclosed Bus Program See Section B.2.40.

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.E5	Fuse Holders	Not credited for aging management. There are no in-scope fuse holders that contain fuses which are routinely manipulated. The fuse boxes are not exposed to weather conditions or chemical contamination, and due to the Columbia location in rural central Washington, they are not exposed to industrial pollution or salt deposition. An inspection of a sample of the passive fuse boxes showed that they are clean and dry, with no evidence of corrosion. Similarly, ohmic heating, thermal cycling, electrical transients, and vibration do not apply to the passive fuse boxes at Columbia because the fuses are not heavily loaded and do not experience frequent electrical and thermal cycling. Vibration is an induced aging mechanism, and is not applicable because the electrical boxes are securely mounted on walls.
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection See Section B.2.21.
NUREG-1801 Chapter X		
X.M1	Metal Fatigue of Reactor Coolant Pressure Boundary	Fatigue Monitoring Program See Section B.2.24.
X.S1	Concrete Containment Tendon Prestress	Not Applicable. Columbia has a General Electric Mark II steel containment and this structure does not contain pre-stressed tendons, as described in FSAR Section 3.8.2.1.
X.E1	Environmental Qualification (EQ) of Electrical Components	EQ Program See Section B.2.22.
Columbia Plant-Specific Programs		
N/A	Plant-Specific Program	Air Quality Sampling Program See Section B.2.2.

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	High-Voltage Porcelain Insulators Aging Management Program See Section B.2.31.
N/A	Plant-Specific Program	Potable Water Monitoring Program See Section B.2.43.
N/A	Plant-Specific Program	Preventive Maintenance – RCIC Turbine Casing See Section B.2.44.

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Aboveground Steel Tanks Inspection Section B.2.1	New	--	Yes	--	--
Air Quality Sampling Program Section B.2.2	Existing	--	--	Yes	--
Appendix J Program Section B.2.3	Existing	Yes	--	--	--
Bolting Integrity Program Section B.2.4	Existing	--	Yes	--	--
Buried Piping and Tanks Inspection Program Section B.2.5	Existing	Yes	--	--	Yes
BWR Feedwater Nozzle Program Section B.2.6	Existing	Yes	--	--	--
BWR Penetrations Program Section B.2.7	Existing	Yes	--	--	--
BWR Stress Corrosion Cracking Program Section B.2.8	Existing	Yes	--	--	--
BWR Vessel ID Attachment Welds Program Section B.2.9	Existing	Yes	--	--	--

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801 (continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
BWR Vessel Internals Program Section B.2.10	Existing	Yes	--	--	--
BWR Water Chemistry Program Section B.2.11	Existing	Yes	--	--	--
Chemistry Program Effectiveness Inspection Section B.2.12	New	Yes	--	--	--
Closed Cooling Water Chemistry Program Section B.2.13	Existing	--	Yes	--	Yes
Cooling Units Inspection Section B.2.14	New	Yes	--	--	--
CRDRL Nozzle Program Section B.2.15	Existing	Yes	--	--	--
Diesel Starting Air Inspection Section B.2.16	New	Yes	--	--	--
Diesel Systems Inspection Section B.2.17	New	Yes	--	--	--
Diesel-Driven Fire Pumps Inspection Section B.2.18	New	Yes	--	--	--

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801 (continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program Section B.2.19	New	Yes	--	--	--
Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program Section B.2.20	New	Yes	--	--	--
Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection Section B.2.21	New	--	Yes	--	--
EQ Program Section B.2.22	Existing	Yes	--	--	--
External Surfaces Monitoring Program Section B.2.23	Existing	Yes	--	--	Yes
Fatigue Monitoring Program Section B.2.24	Existing	Yes	--	--	Yes
Fire Protection Program Section B.2.25	Existing	--	Yes	--	--

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801 (continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Fire Water Program Section B.2.26	Existing	Yes	--	--	Yes
Flexible Connection Inspection Section B.2.27	New	--	Yes	--	--
Flow-Accelerated Corrosion (FAC) Program Section B.2.28	Existing	Yes	--	--	Yes
Fuel Oil Chemistry Program Section B.2.29	Existing	--	Yes	--	--
Heat Exchangers Inspection Section B.2.30	New	Yes	--	--	--
High-Voltage Porcelain Insulators Aging Management Program Section B.2.31	Existing	--	--	Yes	--
Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program Section B.2.32	New	Yes	--	--	--
Inservice Inspection (ISI) Program Section B.2.33	Existing	Yes	--	--	--
Inservice Inspection (ISI) Program – IWE Section B.2.34	Existing	Yes	--	--	--

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801 (continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Inservice Inspection (ISI) Program – IWF Section B.2.35	Existing	Yes	--	--	--
Lubricating Oil Analysis Program Section B.2.36	Existing	Yes	--	--	Yes
Lubricating Oil Inspection Section B.2.37	New	Yes	--	--	--
Masonry Wall Inspection Section B.2.38	Existing	Yes	--	--	Yes
Material Handling System Inspection Program Section B.2.39	Existing	Yes	--	--	Yes
Metal-Enclosed Bus Program Section B.2.40	New	--	Yes	--	--
Monitoring and Collection Systems Inspection Section B.2.41	New	Yes	--	--	--
Open-Cycle Cooling Water Program Section B.2.42	Existing	--	Yes	--	Yes
Potable Water Monitoring Program Section B.2.43	Existing	--	--	Yes	Yes

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801 (continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Preventive Maintenance – RCIC Turbine Casing Section B.2.44	Existing	--	--	Yes	--
Reactor Head Closure Studs Program Section B.2.45	Existing	Yes	--	--	--
Reactor Vessel Surveillance Program Section B.2.46	Existing	Yes	--	--	--
Selective Leaching Inspection Section B.2.47	New	Yes	--	--	--
Service Air System Inspection Section B.2.48	New	Yes	--	--	--
Small Bore Class 1 Piping Inspection Section B.2.49	New	Yes	--	--	--
Structures Monitoring Program Section B.2.50	Existing	Yes	--	--	Yes
Supplemental Piping/Tank Inspection Section B.2.51	New	Yes	--	--	--

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801 (continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program Section B.2.52	New	Yes	--	--	--
Water Control Structures Inspection Section B.2.53	Existing	Yes	--	--	Yes

B.2.1 Aboveground Steel Tanks Inspection

Program Description

The Aboveground Steel Tanks Inspection is a new one-time inspection that will detect and characterize the conditions on the bottom surfaces of the carbon steel condensate storage tanks. The inspection provides direct evidence through volumetric examination as to whether, and to what extent, a loss of material due to crevice, general, or pitting corrosion has occurred or is likely to occur in inaccessible areas (i.e., tank base and bottom surface) that could result in a loss of intended function.

Implementation of the Aboveground Steel Tanks Inspection, in conjunction with the External Surfaces Monitoring Program, will provide added assurance that the pressure boundary integrity of the condensate storage tanks is maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Aboveground Steel Tanks Inspection is a new one-time inspection for Columbia that, in conjunction with the External Surfaces Monitoring Program, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M29, "Aboveground Steel Tanks," with exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Preventive Actions**

  There is no sealant or caulking at the interface edge between the condensate storage tanks and the concrete foundation.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Aboveground Steel Tanks Inspection includes the base (bottom surface and foundation pad interface) of the condensate storage tanks (COND-TK-1A and COND-TK-1B).

  Volumetric examinations will be conducted on sample locations at the tank base to detect evidence of a loss of material due to crevice, general, or pitting corrosion or to confirm a lack thereof.

Periodic inspection of the external surfaces of the tanks (including protective coatings), other than the tank bottoms, is included in the scope of the External Surfaces Monitoring Program.

- Preventive Actions
  The external surfaces of the condensate storage tanks have protective coatings that are consistent with industry practice. However, there is no sealant or caulking at the interface edge between the tanks and concrete foundation.

  No other actions are taken as part of the Aboveground Steel Tanks Inspection or the External Surfaces Monitoring Program to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The Aboveground Steel Tanks Inspection will determine wall thickness as a measure of loss of material for the tank bottom.

  The related parameters inspected by the External Surfaces Monitoring Program include visual evidence of a loss of material or other degradation.

- Detection of Aging Effects
  The Aboveground Steel Tanks Inspection will use established volumetric examination techniques performed by qualified personnel to inspect locations on the bottom surface of a condensate storage tank to determine whether, and to what extent, a loss of material has occurred or is likely to occur during the period of extended operation.

  The Aboveground Steel Tanks Inspection will be conducted after the issuance of the renewed license and prior to the end of the current operating license for Columbia, with sufficient time to implement programmatic oversight for the period of extended operation. The activities will be conducted no earlier than 10 years prior to the end of the current operating license, so that conditions are more representative of the conditions expected during the period of extended operation.

  The results of this inspection will supplement the existing inspection of accessible external surfaces conducted by the External Surfaces Monitoring Program.

- Monitoring and Trending
  No actions are taken as part of the Aboveground Steel Tanks Inspection to monitor or trend inspection results. This is a one-time inspection activity that will use volumetric examination techniques to determine if, and to what extent, further actions, including monitoring and trending, may be required.

The examination techniques for accessible external surfaces, including the condensate storage tanks, are described in the External Surfaces Monitoring Program.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria, i.e., minimum wall thickness. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.

  Acceptance criteria for degradation of external surfaces, including the coatings for the condensate storage tanks, are described in the External Surfaces Monitoring Program.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Aboveground Steel Tanks Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effect. The inspection provides for confirmation of material conditions near the period of extended operation. The elements comprising the inspection activity are to be consistent with industry practice.

  No instances of degradation of condensate storage tanks were identified in a review of condition reports. However, to provide added assurance that the component intended function will be maintained during the period of extended operation, inspection of the bottom surface is conservatively warranted.

The operating experience associated with the existing External Surfaces Monitoring Program, which includes the accessible portions of the condensate storage tanks, is addressed under the External Surfaces Monitoring Program evaluation.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Aboveground Steel Tanks Inspection (in conjunction with the External Surfaces Monitoring Program) will verify that there are no aging effects requiring management for the bottom surfaces of the condensate storage tanks or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that the condensate storage tank intended function will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.2 Air Quality Sampling Program

Program Description

The Air Quality Sampling Program will mitigate degradation due to loss of material for carbon steel components in the Diesel Starting Air (DSA) System that contain compressed air and are within the scope of license renewal, to ensure that the integrity of piping and components is maintained. The Air Quality Sampling Program also ensures that the Control Air System (CAS) remains dry and free of contaminants, thereby validating the aging management review conclusion that there are no aging effects that require management. The Air Quality Sampling Program is a combination prevention and condition monitoring program. The program is based on existing commitments to NRC Generic Letter 88-14 and comprises periodic air quality sampling and corresponding actions to remove moisture and particulates from the CAS and DSA systems. The program also performs periodic UT inspections of DSA System air receivers to ensure the pressure boundary integrity is maintained.

Prior to the period of extended operation, the Air Quality Sampling Program will be supplemented by a separate one-time inspection of the piping and components downstream of the DSA System dryers (excluding the DSA System air receivers), based on plant-specific operating experience. The Diesel Starting Air Inspection will detect and characterize the extent to which degradation has occurred in the DSA System dryers and the downstream piping and components (excluding the DSA System air receivers) and provide confirmation that the integrity of the piping and components will be maintained for the period of extended operation.

NUREG-1801 Consistency

The Air Quality Sampling Program is an existing Columbia program that is plant-specific. NUREG-1801 includes a Compressed Air Monitoring Program (XI.M24). Both the NUREG-1801 and Columbia programs are based on the results of responses to Generic Letter (GL) 88-14. However, as described in the Energy Northwest responses to GL 88-14 and subsequent NRC acceptance, the Columbia program is comprised of periodic sampling for air quality. Therefore, the other portions of the NUREG-1801, XI.M24 program are not applicable to Columbia.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Air Quality Sampling Program is credited with managing loss of material for subject components in the DSA System. The scope of the Air Quality Sampling Program includes periodic sampling of the DSA System air quality and corresponding actions, if unacceptable moisture or contaminants are detected, to

mitigate loss of material for steel portions of the system. The scope of the program also includes the performance of biennial UT inspections of the DSA System air receivers to ensure that their pressure boundary integrity will be maintained.

In addition, the scope of the Air Quality Sampling Program includes periodic sampling of the air quality in the CAS to ensure that the compressed air environment remains dry and free of contaminants, thereby ensuring that no aging effects require management for the system.

- Preventive Actions
  The Air Quality Sampling Program includes periodic air sampling (for particulates, hydrocarbons, and dewpoint) of the CAS and DSA systems, to ensure acceptable air quality and corresponding actions, such as dewpoint reduction, if the results are outside acceptable limits. In addition, based on site operating experience, the program involves desiccant inspection and replenishment, air receiver dewpoint reduction, and air receiver blowdown activities, which are conducted as necessary to minimize the accumulation of moisture in the DSA System and any resulting corrosion to system components.

- Parameters Monitored or Inspected
  As described for *Preventive Actions* above, the Air Quality Sampling Program periodically samples the CAS and DSA systems for hydrocarbons, dewpoint, and particulates to verify proper air quality and ensure that the intended function of the systems is maintained. The Air Quality Sampling Program also conducts UT inspections of the DSA System air receivers to determine wall thickness. Inspections are performed by qualified personnel using established nondestructive examination (NDE) techniques for the components being inspected (i.e., ultrasonic examination). Visual inspection of tank internals for evidence of corrosion and corrosion products may be performed. In addition, the Air Quality Sampling Program is supplemented by the separate one-time Diesel Starting Air Inspection for the DSA System dryers and downstream piping and components (excluding the DSA System air receivers) to characterize conditions and provide additional confirmation that the intended function will be maintained through the period of extended operation.

- Detection of Aging Effects
  The Air Quality Sampling Program does not directly inspect for or detect the effects of aging in the CAS. Rather, as described for the *Preventive Actions* element above, the presence of an environmental stressor (moisture), which could lead to corrosion of system components, is detected and moisture, if any, is removed to ensure air quality is maintained.

  To detect loss of material prior to a loss of component intended function, the Air Quality Sampling Program performs UT inspections to measure the wall thickness of the DSA System air receivers.

Refer to the *Operating Experience* discussion below for information on the effectiveness of the Air Quality Sampling Program in minimizing the conditions that could result in the effects of aging (corrosion) in the DSA System. See also the one-time Diesel Starting Air Inspection, which is evaluated separately.

- Monitoring and Trending
  Air quality sampling of the CAS and DSA systems is performed periodically, depending on the results of previous testing. The UT inspection of the DSA System air receivers is performed on a biennial basis. Results are kept in permanent plant files and are available for trending analysis as necessary. Recurring instances of DSA System air quality outside acceptable limits and decreases in wall thickness of the DSA System air receivers have been trended and evaluated through the corrective action program.

- Acceptance Criteria
  Acceptance criteria for the CAS and DSA compressed air are specified for particulates, hydrocarbons, and dewpoint in the surveillance procedures. If the CAS acceptance criteria are not met, the procedure directs entering the failure into the corrective action program which drives actions to reduce the dew point. If the DSA System acceptance criteria are not met, then the procedure directs entering the failure into the corrective action program and directs procedural actions to reduce the dew point.

  Indications or relevant conditions of degradation detected during the inspections of the DSA System air receivers will be compared to pre-determined acceptance criteria (i.e., minimum wall thickness). If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  As described in the Energy Northwest responses to GL 88-14, and confirmed by subsequent site operating experience, air quality testing continues to show that the compressed air is essentially dry and contaminant free. With the exception of the DSA System, there have been no failures or significant degradation of components in compressed air systems, such as the CAS and the Service Air System.

  Industry operating experience is also included. Experience from Beaver Valley was reviewed and confirmed that erosion and corrosion issues should not be expected in the CAS and SA systems at Columbia. Work requests were initiated to perform inspections, which further confirmed that loss of material is not a concern in the CAS and SA systems.

  Recurring dewpoint problems have been experienced with the DSA System, which is more noticeable during the summer months, when ambient humidity is higher. Dewpoint, or moisture content, in the DSA System is a concern for the long-term effects of corrosion and corrosion products on DSA System components. The most critical point in the DSA System for moisture control is at the air receivers and the high-pressure portion of the system upstream of the pressure control valves. Degradation has been identified in the DSA System (e.g., due to excessive moisture content), where the dewpoint has been shown to average +5^{o}C. This degradation has been evaluated by the corrective action process.

  The quarterly sampling of CAS has been effective at maintaining dry, contaminant-free air, thereby minimizing the conditions for degradation. For the DSA System, additional actions to reduce dewpoint, replenish desiccant, and blow down the air receivers are necessary to ensure dry air and to effectively maintain the DSA System air quality.

Required Enhancements

None.

Conclusion

The Air Quality Sampling Program will manage loss of material for susceptible DSA System components exposed to compressed air through its monitoring activities. The Air Quality Sampling Program also will ensure that the CAS environment remains dry and free of contaminants, thereby ensuring that no aging effects require management for the system. The Air Quality Sampling Program, supplemented by the one-time Diesel Starting Air Inspection prior to entering the period of extended operation, provides reasonable assurance that the aging effects will be managed such that DSA components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.3 Appendix J Program

Program Description

The Appendix J Program is a monitoring program that detects degradation of the Primary Containment and systems penetrating the Primary Containment. The Appendix J Program provides assurance that leakage from the Primary Containment will not exceed maximum values for containment leakage. The regulatory basis for the Appendix J Program includes 10 CFR 50 Appendix J Option B, Regulatory Guide 1.163 (Performance-Based Containment Leak-Test Program), and NEI 94-10 (Industry Guideline for Implementing Performance Based Option of 10 CFR Part 50, Appendix J).

The Appendix J Program provides reasonable assurance that the effects of aging are adequately managed to ensure that leakage through the Primary Containment and systems and components penetrating the Primary Containment does not exceed allowable values specified in technical specifications and that their intended function is performed consistent with the current licensing basis for the period of extended operation.

NUREG-1801 Consistency

The Appendix J Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S4, “10 CFR Part 50, Appendix J.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

For Columbia, the integrated leakage rates for Type A tests, and the sum of Type B and Type C leakage rate tests, have been less than the maximum allowable leakage rates specified in the Technical Specifications.

Inservice inspections conducted during Refueling Outage 18 (R18) did not identify any significant age-related degradation of the containment and its penetrations. Two deficiencies were found during the ISI-IWE inspection and were reported in the R18 ISI summary report. Both found items dealt with replacement of individual bolts and were not related to containment integrity.

Type B and C leakage rate test results from the 2007 Refueling Outage (R18) are summarized in the local leak rate test post outage report. The R18 local leak rate test involved ninety-one Type B and C air tests. Twenty-five Type B tests were conducted, including the personnel airlock barrel test. All Type B as found leak rates were below their administrative limits with the exception of the containment-side flange (CEP-V-2A), which had a leak rate exceeding its administrative limit. This flange was checked using a soap solution with test pressure applied and showed no external leakage. This visual inspection confirmed that the leakage recorded was into the system rather than a breach of the containment penetration. Sixty-six Type C tests were conducted. All but eight valves had as found leak rates below their administrative limits. The valves with leak rates in excess of their administrative limit required corrective actions to reduce their leak rates. Of the eight valves with as found leak rates in excess of their administrative limits, five required disassembly and rework, and one valve was replaced. The remaining two valves were successfully flushed and as-left tested without disassembly.

The total as found leakage at the beginning of Refueling Outage 19 (R19) was 19,712 standard cubic centimeters per minute (sccm). This equates to 16.2 percent of the total allowable containment leakage (La) of 121,536 sccm. The values from previous refueling outages (R18) and (R17) were 13,683 sccm and 20,879 sccm respectively.

The total as left leakage at the end of R19 was 13,098 sccm. This equates to 10.8 percent of the total allowable containment leakage (La) of 121,536 sccm and well below the maximum allowable startup containment leakage rate of 0.6La. The values from the previous refueling outages (R18) and (R17) were 14,051 sccm and 17,423 sccm, respectively.

The results of previous Type A tests are shown below. No Type A tests have failed to meet their acceptance criteria at Columbia.

Test Date	Total Leakage (percent)	Acceptance Limit (percent)
02/16/1984	0.2758	0.50
06/17/1987	0.3241	0.50
06/09/1991	0.319	0.50
07/20/1994	0.330	0.50
06/14/2009	0.3418	0.50

The health of the Appendix J Program is reported periodically in terms of performance indicators. The program health reports for 2007 and 2008 indicated no age-related concerns for systems and components within the scope of the Appendix J Program.

The Appendix J Program has been effective in managing the identified aging effects. The site corrective action program and ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The Appendix J Program will be capable of detecting and managing aging effects for the Primary Containment and systems and components penetrating the Primary Containment. The continued implementation of the Appendix J Program provides reasonable assurance that the aging effects will be managed such that the Primary Containment will continue to perform its intended function consistent with the current licensing basis for the period of extended operation.

B.2.4 Bolting Integrity Program

Program Description

The Bolting Integrity Program is a condition monitoring program that consists of existing Columbia activities that, in conjunction with other credited programs (identified in discussions below), address the management of aging for the bolting of subject mechanical components and structural connections within the scope of license renewal. The Bolting Integrity Program relies on manufacturer and vendor information and industry recommendations (in EPRI NP-5067, "Good Bolting Practices") for the proper selection, assembly, and maintenance of bolting for pressure-retaining closures and structural connections. The Bolting Integrity Program consists of the periodic inspection of bolting for indications of degradation such as leakage, loss of material due to corrosion, loss of pre-load, and cracking due to SCC and fatigue.

NUREG-1801 Consistency

The Bolting Integrity Program is a combination of existing activities that are consistent with the 10 elements of an effective aging management program as described in NUREG-1801 Section XI.M18, "Bolting Integrity," with exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Preventive Actions (and Scope of Program)**

  The Bolting Integrity Program does not explicitly address the guidelines outlined in EPRI NP-5769, or as delineated in NUREG-1339. However, the Bolting Integrity Program does rely on the recommendations of the manufacturer and vendor and the industry, contained in related EPRI document NP-5067, including proper material selection, preload, and assembly.

- **Monitoring and Trending**

  Periodic inspection of bolting, other than of the Class 1, 2, 3, and MC bolting performed by the Inservice Inspection (ISI) Program and Inservice Inspection (ISI) Program – IWF, is performed through the External Surfaces Monitoring Program or Structures Monitoring Program, including follow-up inspections if leakage or degradation is detected. The frequency of follow-up inspections is established by engineering evaluation of the identified problem.

- **Acceptance Criteria**

  The Bolting Integrity Program does not specify acceptance criteria for bolting. However, the Inservice Inspection (ISI) Program, Inservice Inspection (ISI) Program – IWF, Structures Monitoring Program, and External Surfaces Monitoring Program, through which the periodic visual inspections of mechanical and structural components within the scope of license renewal are performed, do, or will prior to the period of extended operation, include acceptance criteria for evidence of degradation of components, including the bolting.

Required Enhancements

None.

Operating Experience

Review of operating experience shows that the Bolting Integrity Program, following the guidance of EPRI NP-5067, has been effective in managing aging effects.

No instances of cracking have been identified for bolting or fasteners, although some corroded bolting and facing surfaces (e.g., from general corrosion or as a result of leakage) have been identified at Columbia and corrected. For example, corrosion has been identified for some pump column-to-bowl bolting, and on some valve body-to-bonnet bolting. Corroded bolting has been replaced, and leaking bolted joints and closures have been repaired. There have also been instances of system leaks that may have been due to loss of preload that have been identified and corrected by existing activities in the Bolting Integrity Program.

Conclusion

The Bolting Integrity Program will manage loss of material, loss of pre-load, and cracking for the bolting of pressure-retaining mechanical components and structural connections. The Bolting Integrity Program provides reasonable assurance that the aging effects will be managed such that bolting will continue to perform its intended functions consistent with the current licensing basis for the period of extended operation.

B.2.5 Buried Piping and Tanks Inspection Program

Program Description

The Buried Piping and Tanks Inspection Program will manage the effects of loss of material due to corrosion on the external surfaces of piping and tanks exposed to a buried environment.

The Buried Piping and Tanks Inspection Program is a combination of a mitigation program (consisting of protective coatings) and a condition monitoring program (consisting of visual inspections). Integrity of coatings will be inspected when components are excavated for maintenance or other reasons. If an opportunistic inspection has not occurred between year 30 and year 38, an excavation of a section of buried piping for the purpose of inspection will be performed before year 40. An additional inspection of buried piping will be performed within 10 years after entering the period of extended operation.

The Buried Piping and Tanks Inspection Program will continue to ensure that the pressure boundary integrity of the subject components is maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Buried Piping and Tanks Inspection Program is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M34, “Buried Piping and Tanks Inspection.”

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Scope of Program –**

  Revise the site program document to include the buried portions of the Radwaste Building Outside Air (WOA) piping.

- **Detection of Aging Effects –**

  Require that an inspection of a representative sample of buried piping be performed within the 10-year period prior to entering the period of extended operation (i.e., between year 30 and year 40).

  Require an additional inspection of a representative sample of buried piping be performed within 10 years after entering the period of extended operation (i.e., between year 40 and year 50).

Operating Experience

No history of piping degradation due to external corrosion of buried piping was identified for Columbia through searches of operating experience or discussions with program owners. Columbia operating experience demonstrates that the coating of buried steel piping and tanks is effective in managing the effects of aging. Plant design considerations addressed the potential for degradation of buried piping components through the application of protective coatings.

A review was conducted of station piping failures, and it was determined that there had been no documented failures attributed to externally-initiated corrosion. Identified instances of leakage associated with buried piping have been the result of internal corrosion.

The environmental conditions at Columbia are very good based on the sandy soil and electrolyte resistivity of the soil which is considered very high. This has resulted in minimal degradation of buried piping as evidenced by excavations of certain sections of piping for examination. There have been no significant areas of degradation caused by protective coating failure. This was determined after a section of buried Standby Service Water (SW) System piping was excavated and evaluated in 2007.

Conclusion

The Buried Piping and Tanks Inspection Program will manage loss of material due to corrosion for susceptible piping components and tanks in buried environments. The Buried Piping and Tanks Inspection Program, with the required enhancements, provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.6 BWR Feedwater Nozzle Program

Program Description

The BWR Feedwater Nozzle Program manages cracking due to SCC/IGA and flaw growth of the feedwater nozzles. The BWR Feedwater Nozzle Program is an existing program in accordance with ASME Section XI and NRC augmented requirements.

The program consists of (a) enhanced inservice inspection in accordance with the requirements of the ASME Code, Section XI, Subsection IWB, Table IWB 2500-1 (2001 edition including the 2002 and 2003 Addenda) and the recommendations of General Electric (GE) NE-523-A71 0594-A, and (b) system modifications to mitigate cracking. The program specifies periodic ultrasonic inspection of critical regions of the feedwater nozzles.

As described in FSAR Section 5.3.3.1.4.5, the solution of the feedwater nozzle cracking problems involved several elements, including material selection and processing, nozzle clad elimination, and thermal sleeve and sparger redesign. The Columbia sparger design includes a welded thermal sleeve such that there is no thermal sleeve bypass and no rapid thermal cycling of the blend radius for each feedwater nozzle. Stainless steel cladding of the Columbia feedwater nozzles was not included in the original design.

The original feedwater (FW) flow controller satisfied most of the recommended characteristics of a low flow controller. Consequently, replacement of this controller was not required at Columbia. Columbia rerouted the reactor water cleanup (RWCU) such that it discharges into all six feedwater nozzles.

Columbia performed a pre-service inspection ultrasonic examination of the feedwater nozzle inner radii, bore, and safe end regions. In addition, a pre-service liquid penetrant examination was performed on the accessible areas of all feedwater nozzle inner radius surfaces.

The BWR Feedwater Nozzle Program at Columbia monitors cracking by detection and sizing of cracks using ISI in accordance with ASME Section XI, Subsection IWB. The BWR Feedwater Nozzle Program at Columbia includes augmented inservice inspection (ISI) examinations to monitor crack initiation and growth of the feedwater nozzles. The schedule, examination techniques and personnel qualification recommendations of GE NE-523-A71-0594-A have also been incorporated into the Inservice Inspection (ISI) Program.

All ISI indications are evaluated to the ASME Code requirements for the component involved. Evaluation is performed in accordance with established site procedures that require use of the ASME Code, or other documents such as BWRVIP documents, if applicable.

The BWR Feedwater Nozzle Program credits portions of the Inservice Inspection (ISI) Program.

NUREG-1801 Consistency

The BWR Feedwater Nozzle Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801 Section XI.M5, "BWR Feedwater Nozzle."

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

Industry Experience:

NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

Review of recent BWR License Renewal Applications identified the following industry experience.

Reactor pressure vessel inner radius section ultrasonic examinations were performed for nozzles N4A, N4B, N4C and N4D at Cooper in 2005. No indications that required evaluation were recorded during these examinations. In 2007, Duane Arnold Energy Center identified the failure of a sparger bracket keeper which allowed interface wear between the mating surfaces of the sparger bracket and the vessel bracket. Temporary repairs were done to make the sparger acceptable for continued use.

Columbia operating experience:

Columbia operating experience, consistent with industry operating experience, shows that the BWR Feedwater Nozzle Program is effective in managing aging effects in that no feedwater nozzle cracking has been observed at Columbia. Inspections of four feedwater nozzles in the spring of 2005 found no unacceptable indications. Inspection of the nozzle, inner radius, bore, and associated safe end of two feedwater nozzles in the spring of 2009 found no unacceptable indications. Therefore, continued implementation of the program provides reasonable assurance that the effects of aging will be managed so that the feedwater nozzles will continue to perform their intended function consistent with the current licensing basis during the period of extended operation.

The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The BWR Feedwater Nozzle Program manages cracking of the feedwater nozzles. The BWR Feedwater Nozzle Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.7 BWR Penetrations Program

Program Description

The BWR Penetrations Program manages cracking due to stress corrosion cracking (SCC) or intergranular stress corrosion cracking (IGSCC) of stainless steel or nickel alloy reactor vessel penetrations, including reactor vessel instrument penetrations, jet pump instrument penetrations, control rod drive penetrations, and incore instrument penetrations. Columbia inspects all reactor vessel penetrations in accordance with the requirements of ASME Section XI. The ASME Section XI examinations are supplemented by approved BWRVIP reports.

Columbia detects and sizes cracks in accordance with the guidelines of approved BWRVIP documents and the requirements of the ASME Code, Section XI, 2001 Edition, 2003 Addenda, Section XI, IWB-3000, "Standards for Examination Evaluations." Evaluation of flaws in accordance with established site procedures and ASME Code or BWRVIP requirements may result in re-inspection or sample expansion. Acceptance of components for continued service is in accordance with the ASME code or the BWRVIP program guidance, as applicable. Repair and replacement would include the guidance in BWRVIP-53 and BWRVIP-57.

The Columbia instrumentation penetrations are low alloy steel, welded to the reactor vessel with nickel alloy weld material. This configuration is addressed in BWRVIP-49-A and no further inspections beyond ASME Section XI requirements are recommended. The BWR Penetrations Program incorporates BWRVIP-49-A and will be revised if future revisions to BWRVIP-49-A require further inspections.

Columbia's SLC system injects through the core spray nozzles rather than the SLC nozzle. Thus, consistent with Section 1.1 of BWRVIP-27-A, this BWRVIP document does not apply to Columbia. Consequently, cracking of Columbia's SLC penetration is managed by the Inservice Inspection (ISI) Program rather than the BWR Penetrations Program. The BWR Penetrations Program incorporates BWRVIP-27-A and will be revised if future revisions to BWRVIP-27-A make it applicable to Columbia.

The Columbia drain nozzle is low alloy steel and is not susceptible to SCC/IGSCC. Degradation of this penetration is managed by the Inservice Inspection (ISI) Program rather than BWR Penetrations Program.

The BWR Penetrations Program credits portions of the Inservice Inspection (ISI) Program.

NUREG-1801 Consistency

The BWR Penetrations Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M8, “BWR Penetrations.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

Industry Experience:

> NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.
>
> As a participant in the BWRVIP, Columbia is committed to incorporate lessons learned from operating experience of the entire BWR fleet.
>
> Review of recent BWR license renewal applications found the following industry experience.
>
> > At Cooper, the nozzle-to-safe-end welds of instrument nozzle and SLC nozzle were ultrasonically examined and found acceptable in 2005. Each of the instrument penetration nozzles were inspected and found acceptable during pressure testing in 2003 and in 2005.
> >
> > During Refueling Outage (RFO) 16 at Duane Arnold Energy Center inspections of weld susceptible to intergranular stress corrosion cracking (IGSCC) identified flaw indications on three recirculation riser nozzle-to-safe-end welds (RRB-F002 , RRD-F002 and RRF-F002). The original scope of the examinations included three recirculation riser and one core spray nozzle-to-safe-end welds. The inspection scope was therefore expanded to include all of the remaining F002 welds, as well as the other similarly designed core spray welds. One weld was ground flush and re-inspected, and has been dispositioned. Two welds were repaired using weld overlays.

Columbia operating experience:

> Columbia operating experience to date has found no indications of cracking in the reactor vessel penetrations.

Both Columbia and industry operating experience shows that the BWR Penetrations Program has been effective in managing aging effects. Therefore, continued implementation of the program provides reasonable assurance that effects of aging will be managed so that the reactor vessel penetrations crediting this program will continue to perform their intended function consistent with the current licensing basis during the period of extended operation.

Conclusion

The BWR Penetrations Program manages cracking of the in-scope reactor vessel penetrations. The BWR Penetrations Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review and crediting this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.8 BWR Stress Corrosion Cracking Program

Program Description

The BWR Stress Corrosion Cracking Program manages stress corrosion cracking for stainless steel and nickel alloy piping, nozzle safe ends, nozzle thermal sleeves, valves, flow elements, and pump casings. The program to manage stress corrosion cracking and intergranular attack (SCC/IGA) in reactor coolant pressure boundary piping made of stainless steel and components made of stainless steel or nickel alloy is delineated in NUREG-0313, Revision 2, and GL 88-01 and its Supplement 1. The material includes base metal and welds. The BWR Stress Corrosion Cracking Program meets the requirements of GL 88-01 and BWRVIP-75.

The program consists of (a) preventive measures to mitigate SCC/IGA, and (b) inspection and flaw evaluation to monitor SCC/IGA and its effects. The staff-approved BWRVIP-75 report modified the inspection scope in the GL 88-01 program.

(a) preventive measures to mitigate SCC/IGA

Columbia mitigates stress corrosion cracking by using, and continuing to use, materials resistant to SCC for component replacements and repairs following the recommendations delineated in GL 88-01. Prior to initial plant startup and during the first refueling outage, an induction heating stress improvement (IHSI) process was used on 148 SCC/IGA susceptible piping welds. In the 1994 refueling outage, Columbia performed a mechanical stress improvement process (MSIP) for multiple RPV nozzle to safe end and safe end to pipe welds.

Columbia mitigates aging by maintaining water chemistry in accordance with the current BWRVIP guidelines, as detailed in the BWR Water Chemistry Program. Columbia has implemented hydrogen water chemistry (HWC) and noble metal chemical application (NMCA) to mitigate IGSCC.

(b) Inspection and flaw evaluation

The Columbia program detects and sizes cracks in accordance with the requirements of the ASME Code, Section XI, supplemented by guidelines of approved BWRVIP documents. Inspection of piping to detect and size cracks is performed in accordance with the staff positions on schedule, methods, and personnel and sample expansion included in GL 88-01 and BWRVIP-75. If indications are found, sample expansion occurs per BWRVIP-75.

In response to GL 88-01, Columbia committed to using ASME Section XI Section IWB-3600 of the ASME Code for methods and criteria for crack evaluation and repair. Columbia committed to notify the Commission if a flaw is found that does not meet Section XI, IWB-3500 criteria for continued operation without evaluation.

Further, Columbia committed to submit an evaluation of the flaw justifying continued operation or the repair plans to the Commission for approval prior to resuming operation. Resumption of operation will not be allowed until Commission approval has been granted.

Columbia monitors reactor coolant leakage as recommended by GL 88-01 in compliance with Technical Specification 3.4.5.

The BWR Stress Corrosion Cracking Program credits portions of the BWR Water Chemistry Program.

NUREG-1801 Consistency

The BWR Stress Corrosion Cracking Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M7, "BWR Stress Corrosion Cracking."

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

Industry Experience:

NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

Review of recent BWR license renewal applications found the following industry experience.

In 2000, Cooper Nuclear Station safe end nozzles and piping components were ultrasonically examined and found acceptable. Examinations in 2000 and in 2005 for a nozzle cap had recordable indications, which were caused by ID geometry and determined to be acceptable.

During Refueling Outage (RFO) 16 at Duane Arnold Energy Center, inspections of welds susceptible to intergranular stress corrosion cracking (IGSCC) identified flaw indications on three recirculation riser nozzle-to-safe-end welds (RRB-F002 , RRD-F002 and RRF-F002). The original scope of the examinations included three recirculation riser welds and one core spray nozzle-to-safe-end weld. The inspection scope was therefore expanded to include all of the remaining F002 welds, as well as the other similarly designed core spray welds. One weld was ground flush and re-inspected, and has been dispositioned. Two welds were repaired using weld overlays.

Columbia operating experience:

One indication was identified in stainless steel recirculation system piping to valve weld 20RRC(6)-8 during Refuel Outage 6 (1991). The sample size was expanded in accordance with GL 88-01. The indication did not show IGSCC characteristics; however, it was evaluated as IGSCC. The indication was determined to be acceptable for continued operation without repair. In 1996, after four successive inspections without significant change in the indication, the indication was reclassified to an IGSCC Category E weld in accordance with GL 88-01. The NRC staff was kept informed of the indication status and concurred with the actions taken and the reclassification of the indication. The weld was examined in 2001 using technology approved as part of the EPRI Performance Demonstration Initiative and no indications associated with IGSCC were identified. It was determined that the indication was not due to IGSCC and the weld was reclassified as Category B. All previous examinations were re-evaluated using the 2001 methods, and it was concluded that the indication had shown no identifiable growth in either length or depth in the 10 years that it had been monitored.

A second indication, identified in RRC nozzle to safe end weld 24RRC(2)A-1 in 1998, has been verified to be an original construction weld repair. There is no indication of IGSCC in this weld.

Therefore, continued implementation of the program provides reasonable assurance that stress corrosion cracking of austenitic stainless steel will be managed so that components crediting the BWR Stress Corrosion Cracking Program will continue to perform their intended function consistent with the current licensing basis during the period of extended operation.

The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The BWR Stress Corrosion Cracking Program manages cracking of stainless steel and nickel alloy components. The BWR Stress Corrosion Cracking Program provides reasonable assurance that cracking of stainless steel and nickel alloy components will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.9 BWR Vessel ID Attachment Welds Program

Program Description

The BWR Vessel ID Attachment Welds Program will manage cracking due to SCC/IGA of the welds for internal attachments to the reactor vessel.

The BWR Vessel ID Attachment Welds Program performs examinations and inspections as required by ASME Section XI, augmented by BWRVIP-48-A. These inspections include enhanced visual inspections with resolution to the guidelines in BWRVIP-03.

Inspections are scheduled in accordance with the ASME Code, Section XI. Approval for any exceptions to the ASME Code requirements is requested from the NRC via a Relief Request or an Exemption Request. Columbia has scheduled inspections in accordance with ASME Section XI, IWB-2400 and approved BWRVIP-48-A guidelines. If flaws are detected, the scope of the examination is expanded in accordance with ASME Section XI and BWRVIP-48-A.

Cracks are detected and sized by inspection in accordance with the guidelines of approved BWRVIP documents and the requirements of the ASME Code, Section XI. Evaluation is performed in accordance with established site procedures that require use of the ASME Code and other applicable documents, such as BWRVIP reports.

The program includes preventive measures to mitigate cracking by maintaining water chemistry in accordance with the current BWRVIP guidelines using the BWR Water Chemistry Program.

The BWR Vessel ID Attachment Welds Program credits portions of the BWR Water Chemistry Program, the BWR Vessel Internals Program and the Inservice Inspection (ISI) Program.

NUREG-1801 Consistency

The BWR Vessel ID Attachment Welds Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801 Section XI.M4, “BWR Vessel ID Attachment Welds.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

Industry operating experience:

NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

Review of recent License Renewal Applications found no instances of aging. At Cooper Nuclear Station, a combination of components including guide rod brackets, feedwater sparger brackets, and core spray sparger brackets was examined in 2001 and 2003 with no recordable indications for the guide rod and feedwater sparger brackets. Indications found in 2000 on the core spray sparger brackets were determined to be acceptable. Jet pump riser brace attachment pad welds and steam dryer support brackets were examined in 2003 with no indications. Holddown brackets for the surveillance specimens and steam dryer were examined in 2005 with no indications. The jet pump riser brace attachment was also examined with no indications. A review of site-specific operating experience at Duane Arnold Energy Center found no instances of degradation to the vessel ID attachment welds which required repairs.

Columbia operating experience:

Columbia operating experience to date has not detected any flaws in reactor vessel attachment welds. Inspections of the core spray sparger and supply piping attachment welds and five jet pump riser brace attachment welds during Refuel Outage 16 (2003) found no recordable indications. Inspection of the remaining attachment welds during Refuel Outage 17 (2005), including the feedwater bracket, steam dryer, and specimen holders, found no recordable indications.

Columbia site-specific operating experience agrees with industry operating experience in that the BWR Vessel ID Attachment Welds Program has been effective in managing aging effects. Therefore, continued implementation of the program provides reasonable assurance that the effects of aging will be managed so that the reactor vessel inside diameter (ID) attachment welds will continue to perform their intended function consistent with the current licensing basis during the period of extended operation.

The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The BWR Vessel ID Attachment Welds Program manages cracking of the vessel internal attachment welds. The BWR Vessel ID Attachment Welds Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.10 BWR Vessel Internals Program

Program Description

The BWR Vessel Internals Program will manage cracking due to SCC/IASCC, SCC/IGA, flaw growth, and flow-induced vibration for various components and subcomponents of the reactor vessel internals. The Columbia program includes mitigation, inspection, and repair. The BWR Vessel Internals Program incorporates all of the BWRVIP guidance documents, including those specifically called out in NUREG-1801, Section XI.M9.

(a) mitigation

Columbia mitigates reactor vessel internals cracking by maintaining water chemistry in accordance with the current BWRVIP guidelines using the BWR Water Chemistry Program.

(b) inspection

Inspection is performed by the Inservice Inspection (ISI) Program as required by the ASME Code. Augmented inspections as recommended by the BWRVIP program are performed by the BWR Vessel Internals Program. The BWRVIP requirements typically include more stringent inspections and components beyond the ASME requirements. The Columbia program includes enhanced visual examinations, including the equipment and environmental conditions necessary to achieve the resolution recommended by the BWRVIP guidelines.

Columbia implements all the BWRVIP requirements, including re-inspection and sample expansion requirements. Columbia detects and sizes cracks in accordance with the guidelines of approved BWRVIP documents and the requirements of the ASME Code, Section XI, 2001 Edition, 2003 Addenda.

Columbia evaluates all flaws in accordance with either the ASME code or BWRVIP guidance. Flaw evaluations that deviate from the guidance in BWRVIP reports are submitted to the NRC for approval.

(c) repair

Repair or replacement, as necessary, is performed in accordance with approved BWRVIP documents and ASME Section XI, as applicable.

Columbia's top guide will have received neutron fluence exceeding the IASCC threshold (5E20, E>1 MeV) before entering the period of extended operation. Columbia complies with BWRVIP-183. Although BWRVIP-183 has not yet been approved by the NRC staff, it includes the top guide inspections recommended by NUREG-1801. BWRVIP-

183 requires either EVT-1 or UT inspection of 10% of the top guide grid beam cells containing control rod drives and blades every 12 years with at least 5% to be performed within 6 years.

The BWR Vessel Internals Program credits portions of the BWR Water Chemistry Program and the Inservice Inspection (ISI) Program.

NUREG-1801 Consistency

The BWR Vessel Internals Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801 Section XI.M9, “BWR Vessel Internals.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

Industry operating experience:

> NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.
>
> Review of recent License Renewal Applications shows that BWRs continue to inspect per the BWRVIP guidelines and that occasional indications are found and dispositioned. No indications were reported that required repair or replacement of any component.

Columbia operating experience:

> Columbia operating experience is consistent with industry experience; a large number of examinations are being performed, and an occasional indication is being found and resolved. Columbia has found cracking of the core shroud, cracking of the steam dryer, gaps on the jet pump set screws, and wear of the jet pump wedges. All conditions have been evaluated and actions taken in accordance with approved BWRVIP documents for the component involved. No aging mechanisms not already

addressed by the BWRVIP have been discovered. The extensive industry operating experience with the BWRVIP to date provides assurance that the program is effective in managing the effects of aging so that components crediting these programs will continue to perform their intended function consistent with the current licensing basis during the period of extended operation.

INPO conducted a BWRVIP vessel and internals review visit at Columbia during 2005 that resulted in three recommendations for Columbia. Columbia conducted a self assessment in 2006 and determined that the BWRVIP program was effective and that the INPO recommendations had been properly implemented. The self assessment also noted that there was strong commitment to the BWRVIP program among Columbia organizations.

The BWR Vessel Internals Program includes provisions to adopt future changes to BWRVIP guidelines. This ensures that operating experience from the BWR fleet will continue to be incorporated into the Columbia program.

The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The BWR Vessel Internals Program manages cracking for the reactor vessel internals components and subcomponents. The BWR Vessel Internals Program provides reasonable assurance that the effects of aging will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.11 BWR Water Chemistry Program

Program Description

The BWR Water Chemistry Program will mitigate damage related to loss of material due to corrosion or erosion, cracking due to SCC, and reduction of heat transfer due to fouling of plant components that are within the scope of license renewal and contain or are exposed to treated water, treated water in the steam phase, reactor coolant, or treated water in a sodium pentaborate solution. The program manages the relevant conditions (e.g., concentrations of chlorides, oxygen, and sulfates) that could lead to the onset and propagation of a loss of material, cracking, or reduction of heat transfer through proper monitoring and control consistent with the current EPRI water chemistry guidelines. The relevant conditions are specific parameters such as sulfates, halogens, dissolved oxygen, and conductivity that could lead to, or are indicative of, conditions for corrosion or SCC of susceptible materials, as well as erosion and fouling. The BWR Water Chemistry Program is a mitigation program.

The BWR Water Chemistry Program is supplemented by separate one-time inspections of representative areas of treated water systems. One inspection is the Chemistry Program Effectiveness Inspection. This one-time inspection provides further confirmation that loss of material and cracking are effectively mitigated, or to detect and characterize whether, and to what extent, degradation is occurring. The other inspection is the Heat Exchangers Inspection. This one-time inspection provides further confirmation that reduction in heat transfer is effectively mitigated, or to detect and characterize whether, and to what extent, degradation is occurring.

Additionally, the BWR Water Chemistry Program is supplemented by the BWR Feedwater Nozzle Program, BWR Stress Corrosion Cracking Program, BWR Penetrations Program, BWR Vessel ID Attachment Welds Program, BWR Vessel Internals Program, Inservice Inspection (ISI) Program, and Small Bore Class 1 Piping Inspection to provide verification of the program's effectiveness in managing the effects of aging for reactor pressure vessel, reactor vessel internals, and reactor coolant pressure boundary components.

NUREG-1801 Consistency

The BWR Water Chemistry Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M2, "Water Chemistry."

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

The BWR Water Chemistry Program is an ongoing program that effectively incorporates the best practices of industry guidance, vendor recommendations, and industry experience in defining chemistry control requirements, monitoring of plant performance in implementing them, and continual review of their adequacy. The program incorporates EPRI guideline documents as well as "lessons learned" from site and other utility operating experience. The program has been, and continues to be, subject to periodic internal and external assessment of the performance to identify strengths, potential adverse trends, and areas for improvement. In addition, quarterly program health reports are generated addressing chemistry performance indicators.

Review of site-specific operating experience did not reveal a loss of component intended function for components exposed to reactor water, feedwater condensate, control rod drive water, accident mitigation water (suppression or fuel pool), or steam that could be attributed to an inadequacy of the BWR Water Chemistry Program. The known chemistry-related problems suffered by other utilities are a consideration in the ongoing refinement of the BWR Water Chemistry Program for Columbia. No change of the BWR Water Chemistry Program was required as a result of these evaluations. Abnormal chemistry conditions are promptly identified, evaluated (with increased sampling to better trend the data), and corrected. Furthermore, the program is periodically updated to the latest guidance documents.

An internal self-assessment of the performance of the BWR Water Chemistry Program is conducted and reported periodically (at least annually) to identify strengths, potentially adverse trends, and areas for improvement. This assessment covers the entire program.

The latest self-assessments noted that the corrective action process is used extensively in the Chemistry Department, and that data review and reporting requirements are in compliance with procedures.

There were also challenges with condenser in-leakage for much of cycle 18; a long-term project to replace the condenser is underway (to solve the leakage problem and issues with copper). Past operating experience has demonstrated the effectiveness of the program in identifying out of specification reactor water chemistry conditions resulting from condenser in-leakage with prompt actions taken to restore below Action Level 1 limits.

Conclusion

The BWR Water Chemistry Program will manage loss of material, cracking, and reduction in heat transfer for susceptible components through monitoring and control of the relevant parameters in treated water (and steam). The BWR Water Chemistry Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.12 Chemistry Program Effectiveness Inspection

Program Description

The Chemistry Program Effectiveness Inspection is a new one-time inspection that will detect and characterize the material conditions in representative low-flow and stagnant areas of plant systems influenced by the BWR Water Chemistry Program, the Fuel Oil Chemistry Program, and the Closed Cooling Water Chemistry Program (which are mitigation programs). The inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, general, galvanic, or pitting corrosion (in treated water or fuel oil environments) has occurred. The inspection provides direct evidence as to whether, and to what extent, microbiologically-influenced corrosion (MIC) in a fuel oil environment has occurred. The inspection also provides direct evidence as to whether, and to what extent, cracking due to SCC of susceptible materials in susceptible locations has occurred.

Implementation of the Chemistry Program Effectiveness Inspection will provide confirmation of program effectiveness and further assurance that the integrity of susceptible components is maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Chemistry Program Effectiveness Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Chemistry Program Effectiveness Inspection includes the surfaces of copper alloy, copper alloy > 15% zinc (Zn), steel, gray cast iron, nickel alloy, and stainless steel (including cast austenitic stainless steel) components in treated water environments. The scope includes gray cast iron, copper alloy, copper alloy > 15% Zn, steel, and stainless steel components in fuel oil environments.

- Preventive Actions
  No actions are taken as part of the Chemistry Program Effectiveness Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Chemistry Program Effectiveness Inspection include wall thickness and visual evidence of surface degradation as measures of loss of material, or of cracking for stainless steel exposed to treated water above 140 ºF and copper alloy > 15% Zn exposed to fuel oil. Inspections will be performed by qualified personnel using established NDE techniques, including visual, volumetric, and surface techniques.

- Detection of Aging Effects
  The Chemistry Program Effectiveness Inspection will use a combination of established volumetric and visual examination techniques (such as equivalent to VT-1 or VT-3) performed by qualified personnel on a sample population of subject mechanical components to identify evidence of a loss of material, or cracking of stainless steel exposed to treated water above 140 ºF and copper alloy > 15% Zn exposed to fuel oil, or to confirm a lack thereof on the susceptible internal and external surfaces of components.

  A sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and design margins.

  The Chemistry Program Effectiveness Inspection will be conducted within the 10-year period prior to the period of extended operation.

- Monitoring and Trending
  This one-time inspection activity is used to characterize conditions and to determine if, and to what extent, further actions may be required. The activity includes increasing the inspection sample size and location if degradation is detected.

  The sample size will be determined by engineering evaluation of the materials of construction, the environment (i.e., service conditions), aging effects, and operating experience (e.g., time in-service, susceptible locations, lowest design margin). Unacceptable inspection results (if degradation is detected), if any, will be evaluated using the Columbia corrective action process to determine the need for subsequent aging management activities and for further monitoring and trending of the results.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria, such as design minimum wall thickness for piping. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Chemistry Program Effectiveness Inspection is a new one-time inspection activity. The inspection provides for confirmation of material conditions, and thereby chemistry program effectiveness, near the period of extended operation. The elements comprising the inspection activity are to be consistent with industry practice.

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  A review of Columbia operating experience identified instances of microbiologically-influenced corrosion in the fuel oil system associated with the fire protection diesel. Corrective actions included more stringent chemical control of new fuel and biocide addition, in addition to cleaning of the tank.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Chemistry Program Effectiveness Inspection will verify the effectiveness of the chemistry programs in managing the effects of aging or will identify corrective actions, possibly including programmatic enhancement, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.13 Closed Cooling Water Chemistry Program

Program Description

The Closed Cooling Water Chemistry Program will mitigate damage due to loss of material, cracking, and reduction in heat transfer of plant components within the scope of license renewal that contain treated water in a closed cooling water system or component (e.g., heat exchanger) served by or connected to a closed cooling water system. The program manages the relevant conditions (e.g., concentrations of chlorides, fluorides, oxygen, and sulfates) that could lead to the onset and propagation of a loss of material, cracking, or reduction of heat transfer through proper monitoring and control of corrosion inhibitor concentrations consistent with current EPRI closed cooling water chemistry guidelines. The relevant conditions are specific parameters such as sulfates, halogens, dissolved oxygen, and conductivity that could lead to, or are indicative of, conditions for corrosion or SCC of susceptible materials, as well as erosion and fouling. The Closed Cooling Water Chemistry Program is a mitigation program.

The Closed Cooling Water Chemistry Program includes corrosion rate measurement at a select location in the Reactor Closed Cooling Water (RCC) System. The program is supplemented by a separate one-time inspection of representative areas of select closed cooling water systems, as well as components served by or connected to those closed cooling water systems, to provide confirmation that loss of material and cracking are effectively mitigated or to further detect and characterize whether, and to what extent, degradation is occurring. The Closed Cooling Water Chemistry Program is supplemented by the Chemistry Program Effectiveness Inspection for managing loss of material and cracking. The Closed Cooling Water Chemistry Program is supplemented by the Heat Exchangers Inspection for managing reduction in heat transfer. The effectiveness inspection and at least one additional measurement of RCC corrosion rates will be performed and evaluated prior to entering the period of extended operation.

NUREG-1801 Consistency

The Closed Cooling Water Chemistry Program is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M21, “Closed-Cycle Cooling Water System,” with exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Parameters Monitored or Inspected (and Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) –**

  The program does not include performance or functional testing for management of loss of material or cracking since performance and functional testing verify that component active functions can be accomplished but, in most cases, provide little definitive information or value with respect to the condition of passive components. In lieu of performance monitoring and functional testing, the Closed Cooling Water Chemistry Program includes measurement of corrosion rates in select RCC System locations and is supplemented by the one-time Chemistry Program Effectiveness Inspection, which includes closed cooling water system locations and heat exchangers served by closed cooling water systems, to confirm adequate mitigation of loss of material and cracking in low flow and stagnant areas. The Closed Cooling Water Chemistry Program is supplemented by the one-time Heat Exchangers Inspection to confirm adequate mitigation of reduction in heat transfer.

Required Enhancements

Prior to the period of extended operation the enhancement listed below will be implemented in the identified program element:

- **Detection of Aging Effects –**

  Ensure that at least one additional RCC corrosion rate measurement is performed and evaluated prior to entering the period of extended operation to provide direct information as to the effectiveness of the chemical treatments. If necessary, based on the results, establish a frequency for subsequent measurements.

Operating Experience

The Closed Cooling Water Chemistry Program is an ongoing program that effectively incorporates EPRI closed cooling water guideline documents as well as “lessons learned” from site and other utility operating experience. The program has been, and continues to be, subject to periodic internal and external assessment of its performance to identify strengths and potential adverse trends. In addition, monthly reports are generated addressing chemistry performance indicators. The February 2008 report identified the parameters for closed cooling water systems; the reactor building closed cooling water, diesel cooling water, and chilled water systems in particular, to be nominal. A November 2004 internal assessment, including industry input, found that the program does an adequate job of maintaining effective chemistry control, with a strength being the aggressiveness in returning out-of-limit parameters to within limits in a timely manner. The assessment found no chemistry control related equipment reliability issues over the scope of the review.

Review of Columbia operating experience did not reveal a loss of component intended function of subject components exposed to closed cooling water that could be attributed to an inadequacy of the Closed Cooling Water Chemistry Program. Furthermore, industry, particularly INPO, operating experience is periodically evaluated by Columbia and incorporated into plant programs. No changes to the Closed Cooling Water Chemistry Program were required as a result of these evaluations.

Review of condition reports (CRs) indicates that abnormal chemistry conditions are identified, evaluated, and corresponding adjustments made to correct the chemistry conditions well before a loss of function would become plausible. Corrosion monitoring probes are also used.

Conclusion

The Closed Cooling Water Chemistry Program will manage loss of material, cracking, and reduction in heat transfer for susceptible components through monitoring and control of the corrosion inhibitor concentrations and relevant parameters in closed cooling water systems and the components that are connected to or served by them. The Closed Cooling Water Chemistry Program, with the required enhancement, and supplemented by the one-time Chemistry Program Effectiveness Inspection and Heat Exchangers Inspection prior to entering the period of extended operation provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.14 Cooling Units Inspection

Program Description

The Cooling Units Inspection is a new one-time inspection that will detect and characterize the material conditions of aluminum, steel, copper alloy, and stainless steel cooling unit components that are exposed to a condensation (internal or external) environment. The Cooling Units Inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, galvanic, general, pitting, or microbiologically influenced corrosion, a reduction in heat transfer due to fouling of heat exchanger tubes and fins, or cracking of aluminum components, has occurred or is likely to occur that could result in a loss of intended function.

Implementation of the Cooling Units Inspection will ensure that the pressure boundary integrity and heat transfer capability of susceptible components are maintained consistent with the current licensing basis during the period of extended operation. Implementation of the inspection will also provide assurance (and confirmation) that the structural integrity of susceptible NSR components will be maintained such that spatial interactions (e.g., leakage) will not result in the loss of any safety-related component intended functions during the period of extended operation.

NUREG-1801 Consistency

The Cooling Units Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Cooling Units Inspection detects and characterizes conditions relative to the following subject mechanical components to determine whether, and to what extent, degradation is occurring:

  - Loss of material due to crevice and pitting corrosion, and MIC of stainless steel components exposed to condensation.
  - Loss of material due to crevice, pitting, and galvanic corrosion, cracking due to SCC, and reduction in heat transfer due to fouling of aluminum heat exchanger fins exposed to condensation.

- Loss of material due to crevice, pitting, and galvanic corrosion and reduction in heat transfer due to fouling of copper alloy heat exchanger tubes exposed to condensation.
- Loss of material due to crevice, pitting, galvanic, and general corrosion and MIC for steel components exposed to condensation.

The Cooling Units Inspection focuses on a representative sample population of subject components at susceptible locations to be defined in the implementing documents. The inspections identify symptomatic evidence of cracking, loss of material, or reduction in heat transfer at other susceptible locations within the scope of the inspection due to the similarities in materials and environmental conditions.

- Preventive Actions
  No actions are taken as part of the Cooling Units Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Cooling Units Inspection are wall thickness or visual evidence of degradation, as measures of loss of material and cracking, and visual evidence of fouling as a measure of reduction in heat transfer. Inspections will be performed by qualified personnel using established NDE techniques.

- Detection of Aging Effects
  The Cooling Units Inspection will use a combination of established volumetric (radiographic testing or ultrasonic testing) and visual (VT-1 or VT-3 or equivalent) examination techniques performed by qualified personnel on a sample population of subject components determined by engineering evaluation, to identify evidence of cracking (of aluminum), a loss of material, or fouling, or to confirm a lack thereof.

  The sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operation, and the lowest design margins.

  The Cooling Units Inspection will be conducted within the 10-year period prior to the period of extended operation.

- Monitoring and Trending
  This one-time inspection activity is used to characterize conditions and determine if, and to what extent, further actions may be required. The activity includes provisions for increasing the inspection sample size and location if degradation is detected.

  The sample size will be determined by engineering evaluation of the materials of construction, the environment (i.e., service conditions), aging effects, and operating experience (e.g., time in-service, most susceptible locations, lowest design margins). Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action process to determine the need for subsequent aging management activities and for monitoring and trending of the results.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Cooling Units Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effects. The inspection provides for confirmation of material conditions near the period of extended operation. The elements comprising the inspection activity are to be consistent with industry practice.

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  A review of Columbia operating experience, documented in recent work orders, revealed that cooling unit coils have been found clean and no leakage was observed.

The site corrective action program and an ongoing review of industry operating experience will be used to ensure that a one-time inspection activity remains the appropriate method for managing the effects of aging for components within the scope of this activity.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Cooling Units Inspection will verify that there are no aging effects requiring management for the subject components, or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation and that spatial interactions (e.g., leakage) will not result in loss of safety-related component intended functions during the period of extended operation.

B.2.15 CRDRL Nozzle Program

Program Description

The CRDRL Nozzle Program manages cracking due to flaw growth of the control rod drive return line (CRDRL) nozzle, safe end, cap, and connecting welds. This program was developed in response to industry events involving the control rod drive return line nozzle. The program includes modifications, mitigation, and inspection.

(a) modification

Columbia has modified the CRDRL by the second option discussed in NUREG-1801, XI.M6, cutting and capping the CRDRL with no alternate return line flow established. The modifications were performed prior to initial startup of the Columbia Unit. Modifications were completed by the vessel Original Equipment Manufacturer (OEM).

Since the modifications were performed prior to initial startup of the Columbia Unit, CRD system functionality was demonstrated by the initial system testing, as described in FSAR Section 14.2. This startup testing and subsequent system operation have demonstrated CRD return flow capacity.

(b) mitigation

Columbia mitigates CRDRL nozzle cracking by maintaining water chemistry in accordance with the current BWRVIP guidelines using the BWR Water Chemistry Program.

(c) inspection

The CRDRL Nozzle Program performs ultrasonic inspection of the nozzle in accordance with ASME Section XI, subsection IWB.

The nozzle to safe end and safe end to cap are category B-J welds and are covered by the Risk Informed ISI Program. In part because of the all low alloy steel construction that is not susceptible to stress corrosion cracking, these are low risk welds and are not scheduled for inspection in the third 10-year interval.

Enhanced ISI / Maintenance Programs are not required as Columbia did not install an alternate return line.NUREG-1801 states that the effects of cracking will also be monitored in accordance with NUREG-0619. For licensees who have cut and capped the CRD return line nozzle with rerouting of the CRD return line, NUREG-0619 requires that during each refueling outage the licensee inspect the welded connection joining the rerouted CRD return line to the system which then returns flow to the reactor vessel. Columbia has used the second option, of not establishing an alternate return line flow, so there is no alternate connection to inspect. This NUREG-0619 requirement is not applicable to Columbia.

Cracking found during inservice inspection is evaluated and dispositioned in accordance with ASME Section XI, subsection IWB. Removing cracks by mechanical means is acceptable per ASME Section XI. However, recent industry practice has been to repair such cracks by weld overlay, in accordance with Code Cases N504-2 and N638. Columbia does not anticipate any indications in their low alloy steel CRDRL nozzle welds; however, should indications be found and repair be required, all available repair techniques would be evaluated. If Columbia opts for a repair technique different from ASME Section XI, a relief request will be submitted for NRC review and approval.

The CRDRL Nozzle Program credits portions of the BWR Water Chemistry Program and the Inservice Inspection (ISI) Program.

NUREG-1801 Consistency

The CRDRL Nozzle Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M6, “BWR Control Rod Drive Return Line Nozzle.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

Industry Experience:

Recent License Renewal Applications report that the CRDRL Nozzle Program is effectively managing aging. During RE22 in 2005 the Cooper Nuclear Stations control rod drive return line nozzle inner radius weld and the nozzle-to shell weld were ultrasonically examined and found acceptable. Absence of aging effects indicates that the preventive actions of the program have been effective. The last inspection of the CRDRL stagnant water pipe welds at Duane Arnold Energy Center was performed during Refueling Outage 18. No indications were found in the welds.

Columbia operating experience:

Columbia operating experience is consistent with industry experience and confirms that the CRDRL Nozzle Program is effective in managing cracking of the CRDRL nozzle. Periodic inspections of the CRDRL nozzle, during the second 10-year ISI interval found no cracking. Therefore, continued implementation of the program provides reasonable assurance that the effects of aging will be managed so that the CRDRL nozzle, safe end, cap, and connecting welds will continue to perform their intended function consistent with the current licensing basis during the period of extended operation.

The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The CRDRL Nozzle Program will manage cracking of the CRDRL nozzle, safe end, cap, and connecting welds. The CRDRL Nozzle Program provides reasonable assurance that cracking will be managed such that the subject components will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.2.16 Diesel Starting Air Inspection

Program Description

The Diesel Starting Air Inspection is a new one-time inspection that will detect and characterize the material condition of the air dryers and downstream stainless steel and steel piping and components in the DSA System (excluding the DSA System air receivers). The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred or is likely to occur.

Implementation of the Diesel Starting Air Inspection will provide confirmation that controls on compressed air quality are effective for the DSA System and that the integrity of the air dryers and downstream piping and components (excluding the DSA System air receivers), will be maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Diesel Starting Air Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Diesel Starting Air Inspection includes the air dryers and, conservatively, the downstream stainless steel and steel piping and components in the DSA System (excluding the DSA System air receivers).

  The DSA System is subject to periodic air quality sampling inspections through the Air Quality Sampling Program to verify that the dewpoint is within specified limits. The Diesel Starting Air Inspection will confirm that the controls on moisture content of the air have been effective in ensuring that unacceptable degradation is not occurring in the air dryers and downstream piping and components (excluding the DSA System air receivers).

- Preventive Actions
  No actions are taken as part of the Diesel Starting Air Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Diesel Starting Air Inspection include wall thickness or visual evidence of internal surface degradation, of the DSA System air dryers and downstream piping and components (excluding the DSA System air receivers) as measures of loss of material. Inspections will be performed by qualified personnel using established NDE techniques (i.e., ultrasonic examination). Visual inspection of downstream piping and components for evidence of corrosion and corrosion products may be performed.

- Detection of Aging Effects
  The Diesel Starting Air Inspection will use a combination of established visual examination techniques and non-destructive methods performed by qualified personnel on a sample population of the DSA System air dryers and downstream piping and components (excluding the DSA System air receivers) to identify evidence of any loss of material.

  There are three air dryers in the DSA System. A sample population of these air dryers and the downstream piping and components will be determined by engineering evaluation based on sound statistical sampling methodology. The results of previous inspections will be utilized in consideration of those components most susceptible to degradation. Components will also be evaluated based upon time in service, the severity of conditions during normal plant operation (i.e., the results of the air quality sampling), and design margins.

  The Diesel Starting Air Inspection will be conducted within the 10-year period prior to the period of extended operation.

- Monitoring and Trending
  No actions are taken as part of the Diesel Starting Air Inspection to monitor or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions (including monitoring and trending) may be required.

  Sample size will be determined by engineering evaluation, as described in the *Detection of Aging Effects* element above. Results of the inspection activities that require further evaluation and resolution (e.g., if degradation is detected), will be evaluated using the Columbia corrective action process, including expansion of the sample size and inspection locations to determine the extent of the degradation.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Diesel Starting Air Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effect. The inspection is intended to determine the condition of the DSA System air dryers as well as of the downstream piping and components (excluding the DSA System air receivers), and whether additional controls are required for the period of extended operation.

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  A review of Columbia operating experience reveals that the air receiver tanks have been inspected regularly for indications of loss of material. Relevant operating experience associated with DSA System air receivers is used to identify relevant age related degradation for the DSA System; however, aging of the DSA System air receivers is managed by the Air Quality Sampling Program. Inspection techniques for the air dryers and downstream piping and components will be consistent with accepted industry practices.

  The site corrective action program and an ongoing review of industry operating experience will be used to ensure that a one-time inspection activity remains the appropriate method for managing the effects of aging for components within the scope of this activity.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Diesel Starting Air Inspection will verify that there are no aging effects requiring management for the subject components or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions of the DSA System will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.17 Diesel Systems Inspection

Program Description

The Diesel Systems Inspection is a new one-time inspection that will detect and characterize the material condition of the interior of the exhaust piping for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust System, including the loop seal drains from the exhaust piping, and the drain pans and drain piping associated with air-handling units of the Diesel Building HVAC systems. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred or is likely to occur.

Implementation of the Diesel Systems Inspection will provide confirmation that the integrity of the subject components will be maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Diesel Systems Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Diesel Systems Inspection includes the steel exhaust piping exposed to an air-outdoor environment, and the loop seal drains from the exhaust piping that are exposed to a raw water environment, for the following diesel engines:

  - DG-ENG-1A1/1A2
  - DG-ENG-1B1/1B2
  - DG-ENG-1C
  - DSA-ENG-C/2C

  Additionally the stainless steel drain pans and steel drain piping exposed to a raw water environment and associated with the following equipment are in the scope of the Diesel Systems Inspection:

- DMA-AH-11, 12, 21, 22, 31, 32, and 51 (air-handling unit housings)

- Preventive Actions
No actions are taken as part of the Diesel Systems Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
The parameters to be inspected by the Diesel Systems Inspection include wall thickness or visual evidence of internal surface degradation, of the diesel exhaust piping and the drain pans and drain piping as measures of loss of material. Inspections will be performed by qualified personnel using established NDE techniques (i.e., ultrasonic examination). Visual inspection of the internals for evidence of corrosion and corrosion products may be performed as opportunities for access arise.

- Detection of Aging Effects
The Diesel Systems Inspection will use a combination of established volumetric and visual examination techniques (such as equivalent to VT-1 or VT-3) performed by qualified personnel on a representative sample of the subject components to identify evidence of loss of material.

  The sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and design margins.

  The Diesel Systems Inspection will be conducted after the issuance of the renewed license and prior to the end of the current operating license, with sufficient time to implement programmatic oversight for the period of extended operation. The activities will be conducted no earlier than 10 years prior to the end of the current operating license, so that conditions are more representative of the conditions expected during the period of extended operation.

- Monitoring and Trending
This one-time inspection activity is used to characterize conditions and to determine if, and to what extent, further actions may be required. The activity includes provisions for increasing the inspection sample size and locations if degradation is detected.

  The sample size will be determined by engineering evaluation of the materials of construction, the environment (i.e., service conditions), aging effects, and operating experience (e.g., time in-service, susceptible locations, lowest design margins). Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action process to determine the need for subsequent aging management activities and for further monitoring and trending of the results.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria. Inspection results will be compared against minimum wall thickness values established in accordance with design requirements or engineering evaluation. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Diesel Systems Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effect. The activity provides confirmation of conditions where degradation is not expected, has not evidenced as a problem, or where the aging mechanism is slow acting. The inspection provides for confirmation of material conditions near the period of extended operation. The elements comprising the inspection activity are to be consistent with industry practice.

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  A review of Columbia operating experience to date has found no indications of loss of material in the subject diesel system components. The site corrective action program and an ongoing review of industry operating experience will be used to ensure that a one-time inspection activity remains the appropriate method for managing the effects of aging for components within the scope of this activity.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Diesel Systems Inspection will verify that there are no aging effects requiring management for the subject components or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that the intended functions of the subject components will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.18 Diesel-Driven Fire Pumps Inspection

Program Description

The Diesel-Driven Fire Pumps Inspection is a new one-time inspection that will detect and characterize the material condition of the interior of the Fire Protection System diesel engine exhaust piping, and of Fire Protection System diesel heat exchangers exposed to a raw water (antifreeze) environment. The inspection provides direct evidence as to whether, and to what extent, a loss of material or reduction in heat transfer has occurred or is likely to occur that could result in a loss of intended function. The inspection also determines whether cracking due to stress corrosion cracking of susceptible materials has occurred. Implementation of the Diesel-Driven Fire Pumps Inspection will ensure that the pressure boundary, structural integrity, and heat transfer capability of susceptible components is maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Diesel-Driven Fire Pumps Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Diesel-Driven Fire Pumps Inspection includes the steel exhaust lines that are exposed to an air-outdoor environment and copper alloy, copper alloy > 15% Zn, gray cast iron, and stainless steel heat exchanger components exposed to a raw water (antifreeze) environment for the following diesels:

  - FP-ENG-1
  - FP-ENG-110

- Preventive Actions
  No actions are taken as part of the Diesel-Driven Fire Pumps Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Diesel-Driven Fire Pumps Inspection include: wall thickness or visual evidence of internal surface degradation, of the diesel exhaust piping and heat exchangers as measures of cracking, loss of material, or reduction in heat transfer. Inspections will be performed by qualified personnel using established NDE techniques (i.e., ultrasonic examination). Visual inspection of the internal surfaces for evidence of corrosion, corrosion products, or fouling may be performed.

- Detection of Aging Effects
  The Diesel-Driven Fire Pumps Inspection will use a combination of established volumetric and visual examination techniques (such as equivalent to VT-1 or VT-3) performed by qualified personnel on the subject components to identify evidence of loss of material due to corrosion or erosion. In addition, the inspection will determine whether cracking due to stress corrosion cracking of copper alloy > 15% Zn or reduction in heat transfer due to fouling of copper alloy and stainless steel heat exchanger tubes exposed to a raw water (antifreeze) environment is occurring.

  The inspection locations will be determined by engineering evaluation and, where practical, focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and lowest design margins.

  The Diesel-Driven Fire Pumps Inspection activities will be conducted within the 10-year period prior to the period of extended operation.

- Monitoring and Trending
  This one-time inspection activity is used to characterize conditions and to determine if, and to what extent, further actions may be required. The activity includes provisions for increasing the number of inspection locations if degradation is detected.

  There are two components in the scope of the inspection (FP-ENG-1 and FP-ENG-110). The inspection locations include the exhaust lines and heat exchanger parts associated with those components. The inspection locations will be determined by engineering evaluation. Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action process to determine the need for subsequent aging management activities and for further monitoring and trending of the results.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective

action program to determine whether they could result in a loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Diesel-Driven Fire Pumps Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effects. The activity provides confirmation of conditions where degradation is not expected, has not been observed, or where the aging mechanism is slow acting. The elements comprising the inspection activity are to be consistent with industry practice.

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  A review of Columbia operating experience reveals past issues associated with the subject components, including a loose clamp, a small oil leak, discolored oil, and a damaged connection pipe. None of these issues are age-related, nor do they involve the subject exhaust piping or heat exchanger components.

  The site corrective action program and an ongoing review of industry operating experience will be used to ensure that a one-time inspection activity remains the appropriate method for managing the effects of aging for components within the scope of this activity.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Diesel-Driven Fire Pumps Inspection will verify that there are no aging effects requiring management for the subject components or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions of the subject components will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.19 Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program

Program Description

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program will manage the aging of electrical cables and connections that are not environmentally qualified and are within the scope of license renewal. The program provides for the periodic visual inspection of accessible, non-environmentally qualified electrical cables and connections, in order to determine if age-related degradation is occurring, particularly in plant areas with adverse localized environments caused by high temperatures or high radiation levels. The program will provide reasonable assurance that the electrical components will continue to perform their intended functions for the period of extended operation.

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program is a new aging management program that will be implemented prior to the period of extended operation, and will be repeated every 10 years thereafter.

NUREG-1801 Consistency

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program is a new Columbia program that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.E1, “Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program includes all cables and connections (terminal blocks, fuse holders, and electrical penetration assemblies) that are not subject to the EQ requirements of 10 CFR 50.49 and that are within the scope of license renewal. The program is credited with detecting aging effects from adverse localized environments in non-environmentally qualified cables and connections.

  This program is directed by physical location in the plant; because there is no simple way (during an inspection) to determine which components are in scope for license renewal and which are not, the program inspections will be prioritized based on location rather than component identification or function.

Particular attention will be given to the identification of adverse localized environments. The inspection program will define these areas through a review of plant engineering data (EQ records, environmental surveys, etc.) and plant walkdowns.

- Preventive Actions
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program is an inspection program; no actions are taken to prevent or mitigate aging degradation. The program is based on visual observation (and detection) only.

- Parameters Monitored or Inspected
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program will provide for the visual inspection of accessible cables and connections located in adverse localized environments. The implementing documents for the program will provide the technical basis for the sample selection, with respect to both sample size and inspection locations. Temperature, radiation, and moisture levels will be considered, along with cable insulation material.

  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program focuses on a visual inspection of accessible cables and connections. The cables and connections will not be touched during the inspection (either lifted, separated, felt, or handled in any way). The inspection will record the visible condition of the cable jacket or the visible condition of the connection (splice, terminal block, fuse block, etc.).

- Detection of Aging Effects
  As described above in *Parameters Monitored or Inspected*, the Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program provides for a visual inspection of a representative sample of accessible electrical cables and connections located in adverse localized environments. The visual inspections will be performed on a 10-year interval, with the first inspection taking place within the 10-year period prior to the end of the current operating license. The program will inspect the accessible cables and connections for aging effects due to heat, radiation, and moisture, in the presence of oxygen. The visible effects are embrittlement, discoloration, cracking, and surface contamination.

- Monitoring and Trending
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program will not include trending actions. If anomalies are found

during the visual inspection process, they will be addressed at that time through the corrective action process.

- Acceptance Criteria
  The inspections of accessible cables and connections will identify unacceptable visual indications of surface anomalies, such as embrittlement, cracking, discoloration, crazing, crumbling, melting, and any other distinct visual evidence of oxidation, material deterioration, or other visible degradation.

  The implementing documents for the Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program will provide specific guidance on the identification of surface degradation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

  In addition, for the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Requirements Program, all unacceptable visual indications of cable and connection jacket surface anomalies are subject to an engineering evaluation. The evaluation will consider the age and operating experience of the component, as well as the severity of the anomaly and whether the anomaly has previously been correlated to degradation of the conductor insulation or connections. Corrective actions may include, but are not limited to, testing, shielding or otherwise changing the environment, and relocation or replacement of the affected cable or connection. When an unacceptable condition or situation is identified, a determination will be made as to whether the same condition or situation is applicable to other in-scope cables or connections.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program is a new program for which there is no direct site-specific operating experience. Based on review of plant-specific and industry operating

experience, the identified aging effects require management for the period of extended operation.

Plant operating experience has shown that the corrective action program has addressed issues of cable degradation in recent years. Cables have been identified with degraded insulation, primarily as a result of exposure to excessive localized overheating. For example, wiring on an insulated cable associated with the B phase of a motor connection was found to be degraded from overheating, due to the hot connection. Also, wiring to level switches located in the Turbine Building was found to be embrittled as a result of close proximity to hot piping. Cables have also been identified with mechanical damage, such as crimping or pinching (although these are not aging issues). Industry operating experience will be included in the development of this program.

Required Enhancements

Not applicable, this is a new program.

Conclusion

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program will manage aging effects due to heat, radiation, and moisture, in the presence of oxygen, for non-environmentally qualified cables and connections. The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program will provide reasonable assurance that the aging effects will be managed such that the non-environmentally qualified cables and connections subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.20 Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program

Program Description

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program will detect and identify age-related degradation associated with sensitive, high-voltage, low-current instrumentation cables and connections that are not environmentally qualified and are within the scope of license renewal. This program addresses a subset of the overall in-scope, non-environmentally qualified cable and connection population at Columbia (which is primarily addressed by the program guidelines of the NUREG-1801, Section XI.EI program – see Section B.2.19).

The program applies to in-scope, non-environmentally qualified electrical cables and connections used in circuits with sensitive, high-voltage, low-current signals (such as radiation monitoring and nuclear instrumentation loops). The sensitive nature of these circuits is such that visual inspection alone may not detect degradation to the insulation resistance function of the conductor insulation. This program will provide the technical input necessary to manage the aging of the non-environmentally qualified low-current instrumentation cables and connections within the license renewal scope. The program relies upon a review of calibration records for surveillance tests routinely performed on the circuits to determine if any degradation to the cable system is occurring. Reduced insulation resistance is the parameter of interest. The cables associated with this program at Columbia are not disconnected from their instruments when the present surveillance testing is performed. The program retains the option to perform direct cable testing.

The following instruments are the components within the scope of the program:

- In-Containment Hi Range Radiation Detectors
- Intermediate Range Neutron Monitors
- Local and Average Power Range Neutron Monitors
- Main Steam Line Radiation Detectors
- Reactor Building Exhaust Plenum Radiation Detectors
- Radwaste Building Remote Intake Radiation Detectors
- Standby Service Water Radiation Detectors

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program is a new aging management program that will be implemented prior to the period of extended operation, and will be performed every 10 years thereafter.

NUREG-1801 Consistency

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program is a new Columbia program that will be consistent with the 10 elements of an effective aging management program, as described in NUREG-1801, Section XI.E2, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits."

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program is credited with identifying aging effects for sensitive, high-voltage, low-current signal applications that are in-scope for license renewal. These sensitive circuits are potentially subject to reduction in insulation resistance (IR) when found in adverse localized environments.

  The scope of the circuits in the program will be detailed fully in the implementing documents. The scope of the program includes the following components:

  - In-Containment Hi Range Radiation Detectors (connectors) (CMS-RIS-27E/F)
  - Intermediate Range Neutron Monitors (all)
  - Local and Average Power Range Neutron Monitors (all)
  - Main Steam Line Radiation Detectors (MS-RIS-610A/B/C/D)
  - Reactor Building Exhaust Plenum Radiation Detectors (REA-RIS-609A/B/C/D)
  - Radwaste Building Remote Intake Radiation Detectors (WOA-RIS-31A/B, -32A/B)
  - Standby Service Water Radiation Monitors (SW-RIS-604/605)

- Preventive Actions
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program involves a review of calibration records of low-current instruments designed to identify cable (and

connection) degradation; no actions are taken to prevent or mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters monitored (reviewed) by the Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program are determined from the specific calibration surveillances. The calibration records (from surveillance testing) of the circuits will be reviewed to determine if there is any indication of the existence of aging effects based on acceptance criteria related to instrumentation circuit performance. The program retains the option to perform direct cable testing of selected circuits.

- Detection of Aging Effects
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program will perform a review of the calibration (surveillance testing) records of the cable systems of sensitive, high-voltage, low-current instrumentation circuits to identify indications of the existence of aging effects based on acceptance criteria related to instrumentation circuit performance. The initial calibration records review will be conducted prior to the period of extended operation, with subsequent reviews to be conducted at least once every 10 years, with the frequency to be determined by engineering evaluation. The program retains the option to perform direct cable testing of selected circuits. If direct cable testing is performed, it will be a proven cable system test for detecting deterioration of the insulation system (such as insulation resistance testing, time-domain reflectometry testing, or other testing judged to be effective in determining the cable insulation condition). Testing will be conducted at least once every 10 years.

- Monitoring and Trending
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program does not include trending actions as part of the program. The review of calibration test results (or, if used, direct cable testing) that can be trended provides additional information on the rate of degradation.

- Acceptance Criteria
  The acceptance criteria for the Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program will be provided by the implementing documents for the program. Results outside the acceptance criteria will be evaluated in conjunction with the corrective action process. The program will utilize guidance from surveillance test procedures in evaluating the readings (anomalies) that are reviewed.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

  In addition, for the Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program, corrective actions such as recalibration and circuit trouble-shooting are implemented when calibration or surveillance results do not meet the acceptable criteria. An engineering evaluation is performed when the test acceptance criteria are not met in order to ensure that the intended functions of the electrical cable system can be maintained consistent with the current licensing basis. Such an evaluation will consider the significance of the test results, the operability of the component, the reportability of the event, the extent of the concern, the potential root causes for not meeting the test acceptance criteria, the corrective actions required, and the likelihood of recurrence.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program is a new program for which there is no direct site-specific operating experience. Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

  Plant operating experience has shown that the corrective action program has addressed issues of cable degradation in recent years. Cables have been identified with degraded insulation, primarily as a result of exposure to excessive localized overheating. Low-current instrument cable issues have also been identified during loop testing, such as a failed source range monitor cable. An intermediate range monitor cable was found smashed against a ladder (although this is not an insulation resistance aging issue). Industry operating experience will be considered in the development of this program.

Required Enhancements

Not applicable, this is a new program.

Conclusion

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program will manage reduction in insulation resistance for non-environmentally qualified cables and connections used in sensitive, high-voltage, low-current circuits. The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program will provide reasonable assurance that the aging effects will be managed such that the non-environmentally qualified cables and connections used in sensitive, high-voltage, low-current circuits that are subject to aging management review, will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.21 Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection

Program Description

The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection will detect and identify aging effects for the metallic parts of non-environmentally qualified electrical cable connections within the scope of license renewal.

This inspection will address cable connections that are used to connect cable conductors to other cables or electrical end devices, such as motor terminations, switchgear, motor control centers, bus connections, transformer connections, and passive electrical boxes such as fuse cabinets. The most common types of connections used in nuclear power plants are splices (butt splices or bolted splices), crimp-type ring lugs, connectors, and terminal blocks. Most connections involve insulating material and metallic parts. The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection will focus primarily on bolted connections. This aging management inspection will account for aging stressors such as thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation of the metallic parts. Implementation of this inspection will provide added assurance that the electrical connections in the plant have electrical continuity and are not overheating due to increased resistance. Performance of this inspection will confirm the absence of aging degradation on electrical cable connections.

The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection is a new aging management activity (a one-time inspection) that will be conducted prior to the period of extended operation.

NUREG-1801 Consistency

The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection is a new one-time inspection that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.E6, “Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements,” with exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Detection of Aging Effects –**

  The one-time inspection does not provide for periodic testing (i.e., at least once every 10 years). Because electrical cable connections for many end devices (such as motors, bus connections, and transformers) are inspected (and repaired or remade as necessary) whenever the end device is tested or worked on, and because Columbia has a thermography program that routinely inspects electrical connections throughout the plant (based on current industry practices), a one-time inspection in response to the guidance of NUREG-1801 XI.E6 is adequate. Performance of the inspection will confirm the absence of aging degradation on electrical cable connections.

The technical methodology utilized by the program (thermography augmented by contact resistance tests) is identical to that of NUREG-1801, XI.E6.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The metallic parts of electrical cable connections, not subject to 10 CFR 50.49, and associated with cables that are within the scope of license renewal, are part of this program, regardless of their association with active or passive components.

  The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection is applicable to non-environmentally qualified electrical cable connections for the site buildings that are within the scope of license renewal.

- Preventive Actions
  No actions are taken as part of this activity to prevent or mitigate aging degradation.

- Parameters Monitored or Inspected
  This inspection will focus on the metallic parts of electrical cable connections. The inspection will include detection of loosened bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. A representative sample of electrical cable connections will be inspected. The following factors will be considered for sampling: application (high, medium, and low voltage), circuit loading, and physical location (high temperature, high humidity, vibration, etc.) with respect to connection stressors. The technical basis for the sample selected will be documented. If an unacceptable condition or situation is identified in the sample, a determination will be made as to whether the same condition or situation is applicable to other connections.

- Detection of Aging Effects
  A representative sample of the metallic electrical cable connections not subject to 10 CFR 50.49 EQ requirements and within the scope of license renewal will receive a one-time inspection via thermography (augmented with contact resistance testing) prior to the period of extended operation. Thermography is a proven test method for detecting loose connections and degraded connections (i.e., chemical contamination, corrosion, oxidation) leading to increased resistance, and will be

used to test a sample of electrical connections at a variety of plant locations. Thermography can detect aging effects due to thermal cycling, ohmic heating, vibration, and electrical transients. Thermography is an effective tool for inspecting connections that are covered by electrical tape, insulating boots or covers, heat-shrink material, and sleeving. Contact resistance testing of a sample of motor termination connections and other connections will also be utilized.

- Monitoring and Trending
  No actions are taken as part of the Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection to monitor or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions, including monitoring and trending, may be required.

  Sample size will be determined by engineering evaluation, as described for the *Detection of Aging Effects* element above. Results of the inspection activities that require further evaluation and resolution (e.g., if degradation is detected), will be evaluated using the corrective action process, including expansion of the sample size and inspection locations to determine the extent of the degradation.

- Acceptance Criteria
  The acceptance criteria for thermography will be based on the current criteria used for the thermography process at Columbia. The acceptance criteria for the contact resistance tests will be defined in the implementing procedure.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

  In addition, for the Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection, an engineering evaluation is performed when the test acceptance criteria are not met in order to ensure that the intended functions of the cable connections can be maintained consistent with the current licensing basis. Such an evaluation will consider the significance of the test results, the operability of the component, the reportability of the event, the extent of the concern, the potential root causes for not meeting the test acceptance criteria, the corrective actions necessary, and the likelihood of recurrence. When an unacceptable condition or situation is identified, a determination is made as to whether the same condition or situation is applicable to other in-scope cable connections.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection is a new activity for which there is no site-specific operating experience. Based on review of plant-specific and industry operating experience, the identified aging effects will require inspection to determine the presence (and extent) of any degradation associated with the non-environmentally qualified cable electrical connections.

  Plant operating experience has shown that the corrective action program has addressed issues related to degraded cable connections in recent years. Cable connections have been identified with degraded electrical continuity (i.e., increased resistance), primarily as a result of loosened electrical connections or corrosion. For example, corroded electrical connections were identified in the cooling tower lighting panels (which are not within the scope of license renewal), and an abnormally warm connection on a diesel generator power panel was identified via thermography. Industry operating experience will be included in the development of this activity.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection will detect and identify aging issues related to the metallic parts of non-environmentally qualified electrical cable connections. The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection will provide reasonable assurance that aging effects will be identified (and addressed) such that the non-environmentally qualified electrical cable connections subject to aging management review will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.2.22 EQ Program

Program Description

The NRC has established nuclear station environmental qualification (EQ) requirements in 10 CFR 50, Appendix A, Criterion 4 and 10 CFR 50.49. 10 CFR 50.49 specifically requires that an environmental qualification program be established to demonstrate that electrical components located in harsh plant environments (i.e., those areas of the plant that could be subject to the harsh environmental effects of a loss of coolant accident, high energy line breaks, or post-LOCA environment) are qualified to perform their safety function in those harsh environments after the effects of aging during service life. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of environmental qualification.

Columbia has established an EQ program for electrical equipment that meets the requirements of 10 CFR 50.49 for electrical components important to safety. 10 CFR 50.49 defines the scope of components to be included, requires the preparation and maintenance of a list of in-scope components, and requires the preparation and maintenance of a qualification file that includes component performance specifications, electrical characteristics, and the environmental conditions to which the components could be subjected. 10 CFR 50.49(e)(5) contains provisions for aging that require, in part, consideration of all significant types of aging degradation that can affect component functional capability. 10 CFR 50.49(e) also requires replacement or refurbishment of components not qualified for the current license term prior to the end of designated life, unless additional life is established through ongoing qualification. 10 CFR 50.49(f) establishes four methods of demonstrating qualification for aging and accident conditions. 10 CFR 50.49(k) and 10 CFR 50.49(l) permit different qualification criteria to apply based on plant and component vintage. Supplemental EQ regulatory guidance for compliance with these different qualification criteria is provided in the Division of Operating Reactor (DOR) Guidelines, NUREG-0588, and Regulatory Guide 1.89 Revision 1. Compliance with 10 CFR 50.49 provides reasonable assurance that the component can perform its intended functions during accident conditions after experiencing the effects of inservice aging.

The EQ Program manages component thermal, radiation, and cyclic aging through the use of aging evaluations based on the methods identified in 10 CFR 50.49(f) and NRC Regulatory Guide 1.89 Revision 1. As required by 10 CFR 50.49, components subject to EQ but not qualified for the entire 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 environmentally qualified components that specify a qualification of at least 40 years are identified as TLAAs for license renewal.

The EQ Program, which implements the requirements of 10 CFR 50.49 (as further defined and clarified by NUREG-0588 and Regulatory Guide 1.89 Revision 1), is an aging management program for license renewal. This existing program is used to manage aging of components in the scope of 10 CFR 50.49 during the current license term and is used routinely to adjust (extend or reduce) qualified life via re-analysis and to determine when replacement or refurbishment is required.

A 40-year administrative limit was placed on qualified life of components in the EQ Program, even when the original EQ analyses indicated a longer qualified life. Prior to entering the period of extended operation, the actual qualified life will be established for those components that were subject to this administrative limit. This actual qualified life will be based on existing analytical methods and data. For those components that do not show a minimum 60-year life after lifting the administrative limit, the EQ Program will ensure qualified life is not exceeded by directing refurbishment, replacement, or re-analysis to extend the qualification.

Re-analysis of an aging evaluation to extend the qualification of components under 10 CFR 50.49(e) is performed on a routine basis as part of the EQ Program. Re-analysis may be applied to environmentally qualified components whose qualified life is less than that of the renewed operating license term. Important attributes for the re-analysis of an aging evaluation include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). A complete discussion of the EQ re-analysis attributes is found in Section 4.4 of the Application.

Consistent with NRC guidance provided in Regulatory Issue Summary 2003-09, no additional information is required to address Generic Safety Issue 168, “Environmental Qualification of Electrical Component.”

NUREG-1801 Consistency

The EQ Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section X.E1, “Environmental Qualification (EQ) of Electrical Components.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

A formal process for review of industry operating experience is used to identify and transfer lessons learned from industry experience into Columbia processes and programs, including the EQ Program. Plant-specific operating experience is identified and evaluated primarily through the corrective action program. Evaluation of both industry and plant-specific operating experience includes consideration of the need to modify qualification bases and conclusions, including qualified life. The EQ Program is in compliance with 10 CFR 50.49, thereby providing reasonable assurance that the environmentally qualified components will be able to perform their intended functions even at the end of their qualified life.

Selected operating experience that affected the qualified lives of environmentally qualified equipment at Columbia are as follows:

- Lead wires on certain normally energized solenoid valves are required to be replaced periodically (from INPO).
- Normally energized relays have been assigned an operating life based on plant-specific operating experience.
- The orientation of ASCO and Marotta solenoid valves is controlled to prevent excessive heat rise to the electrical components (INPO).
- Replacement of Namco switches on the MSIVs is now based on plant-specific operating experience.
- A Columbia EQ procedure was modified to consider the effect of high float voltages on DC coils (industry EQ group operating experience).

Conclusion

The EQ Program is in compliance with the requirements of 10 CFR 50.49 and is successfully being used to manage the aging of equipment in the program during the current license term. The existing EQ Program will be used to manage aging during the period of extended operation and includes provisions to ensure that the qualification bases are maintained and that components do not exceed their qualified lives. The EQ Program provides reasonable assurance that the effects of aging will be adequately managed and that environmentally qualified components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.23 External Surfaces Monitoring Program

Program Description

The External Surfaces Monitoring Program will manage the following aging effects for the external surfaces, and in some cases the internal surfaces, of mechanical components within the scope of license renewal:

- Loss of material for metals (aluminum, copper alloy, copper alloy > 15% Zn, gray cast iron, stainless steel (including CASS), and steel) that are exposed to condensation, air-indoor uncontrolled, and air-outdoor environments
- Cracking of aluminum and stainless steel exposed to condensation environments
- Hardening and loss of strength for elastomer-based mechanical sealants and flexible connections in HVAC systems

The External Surfaces Monitoring Program is a condition monitoring program that consists of visual inspections and surveillance activities of accessible external surfaces on a frequency that generally exceeds once per fuel cycle. Surfaces that are inaccessible during normal plant operation are inspected during refueling outages. Surfaces that are inaccessible or not readily visible during both plant operations and refueling outages, such as surfaces that are insulated, are inspected opportunistically, for example during maintenance activities during which insulation is removed.

The External Surfaces Monitoring Program is supplemented by the Aboveground Steel Tanks Inspection to manage loss of material for the inaccessible external surfaces of the carbon steel condensate storage tanks (i.e., the tank bottom).

NUREG-1801 Consistency

The External Surfaces Monitoring Program is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M36, “External Surfaces Monitoring.”

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Scope of Program –**
    - Add aluminum, copper alloy, copper alloy >15% Zn, gray cast iron, stainless steel (including CASS), and elastomers to the scope of the program.
    - Add cracking as an aging effect for aluminum and stainless steel components.
    - Add hardening and loss of strength as aging effects for elastomer-based mechanical sealants and flexible connections in HVAC systems.
- **Monitoring and Trending –**
    - Add physical examination techniques in addition to visual inspection to detect hardening and loss of strength for elastomer-based mechanical sealants and flexible connections in HVAC systems.
    - Add visual (VT-1 or equivalent) or volumetric examination techniques to detect cracking.

Operating Experience

The elements that comprise the External Surfaces Monitoring Program are consistent with industry practice and have proven effective in maintaining the material condition of Columbia plant systems and components.

A review of the most recent plant-specific operating experience, through a search of condition reports, revealed that minor component leakage (typically at bolted joints and closures), damage (event-driven, not age-related), and degradation are routinely identified by the External Surfaces Monitoring Program, with subsequent corrective actions taken in a timely manner; and that no loss of pressure boundary integrity has occurred that was, or could have been, attributed to the aging effects that are in the scope of the program.

Operating experience associated with the External Surfaces Monitoring Program is routinely documented and communicated to site personnel in System Health Reports. System Health Reports are updated after significant changes, or at least quarterly.

Conclusion

The External Surfaces Monitoring Program will detect and manage loss of material for aluminum, copper alloy, copper alloy >15% Zn, gray cast iron, stainless steel (including CASS), and steel components. The continued implementation of the External Surfaces Monitoring Program, with the required enhancements, provides reasonable assurance that the effects of aging, including cracking for aluminum and stainless steel components and hardening and loss of strength for elastomer-based mechanical sealants and flexible connections in HVAC systems, will be managed such that components subject to aging management will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.24 Fatigue Monitoring Program

Program Description

The Fatigue Monitoring Program manages fatigue of the reactor pressure vessel by tracking thermal cycles as required by Technical Specification 5.5.5, "Component Cyclic or Transient Limit." The Fatigue Monitoring Program also manages fatigue of other components (including the ASME Class 1 reactor coolant pressure boundary, high energy line break locations, and Primary Containment) by tracking transient cycles. The Fatigue Monitoring Program is a combination of time-limited aging analyses (cumulative usage factor calculations) and transient counting procedures.

The Fatigue Monitoring Program uses the systematic counting of plant transient cycles to ensure that the numbers of analyzed cycles are not exceeded, thereby ensuring that component fatigue usage limits are not exceeded.

The BWR Vessel Internals Program contributes to managing fatigue of the jet pumps by checking the jet pump set screw gaps each outage. If any out of specification gaps are found, Columbia will calculate the additional fatigue accumulated by the jet pumps due to those gaps.

The Fatigue Monitoring Program acceptance criteria are to maintain the number of counted transient cycles below the analyzed number of cycles for each transient. The Columbia program periodically updates the cycle counts. When the accumulated cycles approach the analyzed design cycles, corrective action is required to ensure the analyzed number of cycles is not exceeded. Corrective action may include update of the fatigue usage calculation. Any re-analysis will use an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case) to determine a valid CUF.

Columbia has assessed the impact of the reactor coolant environment on the sample of critical components identified in NUREG/CR-6260. These components were evaluated by applying environmental life correction factors to ASME Code fatigue analyses. Formulae for calculating the environmental life correction factors are contained in NUREG/CR-6583 for carbon and low alloy steels and in NUREG/CR-5704 for austenitic stainless steel. The austenitic stainless steel formulae are also applied to nickel alloys. Columbia will enhance the Fatigue Monitoring Program to include the cycles analyzed for the effects of the reactor coolant environment on fatigue prior to the period of extended operation. The enhancement is explained in detail under *Required Enhancements* below.

NUREG-1801 Consistency

The Fatigue Monitoring Program is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary."

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program elements:

- **Preventive Actions, Monitoring and Trending, Acceptance Criteria –**

  Columbia has analyzed the effects of the reactor coolant environment on fatigue for the six locations recommended by NUREG\CR-6260. These analyses are based on the projected cycles for 60 years of operation (plus some conservatism) rather than the original design cycles in FSAR Table 3.9-1. The Fatigue Monitoring Program will be enhanced to ensure that action will be taken when the lowest number of analyzed cycles is approached.

- **Acceptance Criteria –**

  For each location that may exceed a cumulative usage factor (CUF) of 1.0 (due to projected cycles exceeding analyzed, or due to as-yet undiscovered industry issues), the Fatigue Monitoring Program will implement one or more of the following:

  (1) Refine the fatigue analyses to determine valid CUFs less than 1.0.

  This includes refining the analysis to increase accuracy and reduce conservatism. Any re-analysis will use an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case) to determine a valid CUF less than 1.0.

  (2) Manage the effects of aging due to 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).

  Should Columbia select the option to manage the aging effects due to fatigue, the inspection program will meet the following criteria: (1) the inspection program will be based on the 10 elements for an effective aging management program, as defined in NRC Branch Position RLSB-1, (2) the aging management program will be submitted for NRC review and approval at least two years prior to entering the period of extended operation, and (3) the method of inspection will be based on a qualified volumetric examination technique.

(3) Repair or replace the affected locations before exceeding a CUF of 1.0.

By implementation of one or more of these options, Columbia will manage the aging effect of fatigue for the period of extended operation, with consideration of the effects of the reactor coolant environment on fatigue.

- **Scope –**

  Correlate information relative to fatigue monitoring and provide more definitive verification that the transients monitored and their limits are consistent with or bound the FSAR and the supporting fatigue analyses, including the environmentally-assisted fatigue analyses.

Operating Experience

Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

Industry Experience:

NRC document RIS 2008-30 dealt with the use of single dimension stress factors in on-line fatigue analyses. Columbia reviewed RIS 2008-30 and determined that no changes were required to the Columbia Fatigue Monitoring Program. Columbia has no on-line fatigue analyses. Columbia's fatigue analyses of record evaluated multi-dimensional stresses and analyzed the dimensions appropriate to each component.

Columbia operating experience:

The three most recent counting of cycles show the systematic implementation of the Fatigue Monitoring Program.

In August 2000, Columbia operated for a period of time with the recirculation pumps in an unbalanced mode (pump speeds different by more than 50%). The effect of that flow on the fatigue usage of the jet pumps was evaluated. Jet pump clamps were installed on all 20 jet pumps during refueling outage R-17 (2005). Each jet pump mixer was clamped to its diffuser to minimize flow induced vibration caused by leakage at the mixer to diffuser slip joint interface. As long as the set screw gaps remain within their revised criteria no additional fatigue due to bypass leakage flow induced vibration is accumulated. Columbia reviewed the latest gap status after the 2007 outage and extended the usage factor to 60 years. The Columbia Fatigue Monitoring Program will continue to monitor both the occurrence of design cycles and the jet pump gaps, effectively managing the fatigue of the jet pumps through the period of extended operation.

Review of the Fatigue Monitoring Program for license renewal identified improvements for the verification that the Columbia cycle counting program included all the fatigue transients identified in the FSAR and fatigue analyses of record, including the environmentally-assisted fatigue analyses. A review of the program and enhancement of the documentation of that correlation were initiated as part of the License Renewal Project.

The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The Fatigue Monitoring Program is in compliance with the requirements of ASME Section III. The Fatigue Monitoring Program will maintain the validity of the fatigue design basis for reactor coolant system components designed to withstand the effects of cyclic loads due to reactor coolant system transients. The Fatigue Monitoring Program will be used to manage aging during the period of extended operation and includes provisions to ensure that the analyzed transients are not exceeded. The Fatigue Monitoring Program provides reasonable assurance that the effects of aging will be adequately managed and that components will continue to perform their intended functions for the period of extended operation.

B.2.25 Fire Protection Program

Program Description

The Fire Protection Program is an existing program that is described in the Fire Protection Evaluation, Appendix F (Section F.5) of the FSAR, and which is credited with managing loss of material, cracking, delamination, separation, and change in material properties for susceptible components in the scope of license renewal that have a fire barrier function. Periodic visual inspections and functional tests are performed of fire dampers, fire barrier walls, ceilings and floors, fire-rated penetration seals, fire wraps, fire proofing, and fire doors to ensure that functionality and operability are maintained. In addition, the Fire Protection Program supplements the Fuel Oil Chemistry Program and External Surfaces Monitoring Program through performance monitoring of the diesel-driven fire pump fuel oil supply components and testing and inspection of the halon suppression system, respectively. The Fire Protection Program is a condition monitoring program, comprised of tests and inspections in accordance with National Fire Protection Association (NFPA) recommendations.

NUREG-1801 Consistency

The Fire Protection Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M26, “Fire Protection,” with exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope –**

  A low pressure carbon dioxide (suppression) system automatically provides fire protection for the turbine generator exciter housing, as described in FSAR Section F.2.4.5. However, neither the turbine generator exciter nor the associated carbon dioxide suppression system is in the scope of license renewal. As such, aging management of the carbon dioxide suppression system is not required and the associated facets of the site Fire Protection Program are not credited for license renewal.

- **Parameters Monitored or Inspected, Detection of Aging Effects –**

  Functional tests and inspections of the halon suppression system that are included in the Fire Protection Program are performed at an interval greater than biannually, which has been demonstrated to be adequate, based on the absence of any related problems as reported through the corrective action program.

- **Scope, Acceptance Criteria –**

  The Fire Protection Program does not include specific confirmation of "no degradation in the fuel oil supply line for the diesel-driven fire pump." Rather, degradation noted for fuel oil supply components during periodic performance testing of the diesel-driven fire pumps through the Fire Protection Program, if any, is evaluated prior to loss of intended function. In addition, the Chemistry Program Effectiveness Inspection characterizes the internal surface condition of the fuel oil supply line (tubing) for confirmation of the effectiveness of the Fuel Oil Chemistry Program.

Required Enhancements

None.

Operating Experience

A review of fire barrier, essential fire-rated penetration seal, fire wrap, fireproofing, fire door, diesel-driven fire pumps, and halon suppression system inspections previously conducted at Columbia confirms the reasonableness and acceptability of the inspections and their frequency in that degradation of the subject components, although unrelated to aging, was detected prior to loss of function. These inspections have not found any age-related problems.

The NRC presently conducts triennial fire protection team inspections at the Columbia site to assess whether an adequate fire protection program has been implemented and maintained. The most recent of these inspections was conducted in March of 2006 and is documented in Inspection Report 2006-008 for Docket 50-397. This inspection identified one non-significant, non-cited violation (related to electrical circuit vulnerabilities and deferred to allow industry evaluation of the issue), one finding of very low safety significance (related to multiple "hot" shorts in Reactor Protection System circuitry), and one unresolved item that was not related to the portions of the program credited for aging management. The inspection team verified that fire protection-related issues are entered into the corrective action program at an appropriate threshold for evaluation. The inspection team also reviewed the program for implementing compensatory measures in place for out-of-service, degraded, or inoperable fire protection, with no findings identified. The inspection provided verification that manual and automatic detection systems were installed, tested, and maintained in accordance with the NFPA code of record. The inspection team evaluated the adequacy of fire area barriers, penetration seals, fire doors, fire wraps, and fire-rated electrical cables. The team observed the material condition and configuration of the installed barriers, seals, doors, and cables.

In addition, the team reviewed licensee documentation, such as NRC safety evaluation reports, and deviations from NRC regulations and the NFPA codes to verify that fire protection features met license commitments. No findings of significance were found. Additionally, a past triennial NRC inspection of the Fire Protection Program, conducted in March-April of 2003 and documented in Inspection Report 50-397/2003-002, identified the same electrical circuit vulnerabilities that were deferred to allow industry evaluation and resolution, and are not related to the portions of the program credited with aging management. Otherwise, the conclusions of the 2003 inspection were similar to the results of the 2006 inspection.

No NRC concerns or Columbia management concerns (through periodic audits, self-assessments, and health reports) were identified with respect to inspection, testing, and maintenance of the Fire Protection System.

A search was performed of condition reports for the Fire Protection System. When conditions were found that required correction, they were evaluated in accordance with the corrective action program. Examples include degraded Darmatt fire barriers that were found during periodic surveillance activities and repaired. This review identified minor issues that did not affect the effectiveness of the Fire Protection Program or the aging effects under evaluation.

Conclusion

The Fire Protection Program will detect and manage loss of material, cracking, delamination, separation, and change in material properties for susceptible components. The Fire Protection Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.26 Fire Water Program

Program Description

The Fire Water Program (sub-program of the overall Fire Protection Program) is an existing program that is described in the Fire Protection Evaluation, Appendix F (Section F.5) of the FSAR, and which is credited with aging management of the water-based fire suppression components in the scope of license renewal.

The Fire Water Program will manage loss of material due to corrosion, erosion, and macrofouling for all susceptible materials in the Fire Protection System, including water supply components, which are exposed to raw water. The program will also manage cracking due to SCC/IGA of copper alloy > 15% Zn components exposed to raw water.

The Fire Water Program will manage loss of material due to selective leaching for the copper alloy > 15% Zn spray nozzles that are part of a wet-pipe sprinkler configuration that are exposed to raw water. The Selective Leaching Inspection will manage loss of material due to selective leaching of susceptible components other than the wet-pipe spray nozzles.

The Fire Water Program is applicable to a variety of materials, including carbon steel, gray cast iron, copper alloy, copper alloy > 15% Zn and stainless steel, for piping and piping components such as valve bodies, tubing, strainer bodies, standpipes (piping), sprinklers (spray nozzles), pump casings, orifices, and hydrants.

Periodic inspection and testing of water-based fire suppression systems provides reasonable assurance that the systems will remain capable of performing their intended function. Periodic inspection and testing activities include hydrant and hose station inspections, flushing, flow tests, and spray and sprinkler system inspections. The Fire Water Program is a condition monitoring program, comprised of tests and inspections generally in accordance with NFPA recommendations.

Following receipt of the renewed license, and prior to the period of extended operation, the Fire Water Program will be enhanced to incorporate sprinkler head sampling or replacements, in accordance with NFPA 25, and either ultrasonic testing or internal visual inspection of representative above ground portions of water suppression piping that are exposed to water.

NUREG-1801 Consistency

The Fire Water Program is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M27, “Fire Water System.”

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Parameters Monitored or Inspected, Detection of Aging Effects –**

  Perform either ultrasonic testing or internal visual inspection of representative portions of above ground fire protection piping that are exposed to water, but do not normally experience flow, after the issuance of the renewed license, but prior to the end of the current operating term and at reasonable intervals thereafter, based on engineering review of the results.

- **Detection of Aging Effects –**

  Either replace sprinkler heads that have been in place for 50 years or submit representative samples to a recognized laboratory for field service testing in accordance with NFPA 25 recommendations. Perform subsequent replacement or field service testing of representative samples at 10-year intervals thereafter or until there are no sprinkler heads installed that will reach 50 years of service life during the period of extended operation.

- **Acceptance Criteria –**

  Perform hardness testing (or equivalent) of the sprinkler heads as part of their NFPA sampling, to determine whether loss of material due to selective leaching is occurring.

Operating Experience

Water-suppression portions (subsystems) of the Fire Protection System are inspected, tested, and maintained following NFPA recommendations and at the intervals recommended by the corresponding NFPA standards, or as evaluated and adjusted by Columbia. With one exception (a water hammer event in 1998 that led to a fire protection system valve rupture and subsequent flooding), the water-suppression systems have demonstrated reliable performance with no significant problems in the approximate 20 years since their installation. The water hammer issue (and valve failure) was not age-related.

The NRC presently conducts triennial fire protection team inspections at the Columbia site to assess whether an adequate fire protection program has been implemented and maintained. The most recent of these inspections was conducted in March of 2006 and is documented in Inspection Report 2006-008 for Docket 50-397. This inspection identified one non-significant, non-cited violation (related to electrical circuit vulnerabilities and deferred to allow industry evaluation of the issue), one finding of very low safety significance (related to multiple "hot" shorts in Reactor Protection System circuitry), and one unresolved item that were not related to the portions of the program credited for aging management. The inspection team verified that fire protection-related issues are entered into the corrective action program at an appropriate threshold for evaluation. With respect to fire suppression, the inspection team evaluated the adequacy of fire suppression and detection systems, including observation of the material condition and configuration of the installed fire suppression systems, with no findings identified. The inspection team also reviewed the program for implementing compensatory measures in place for out-of-service, degraded, or inoperable fire protection, with no findings identified. The inspection provided verification that manual and automatic detection systems were installed, tested, and maintained in accordance with the NFPA code of record. Additionally, a past triennial NRC inspection of the Fire Protection Program (including the Fire Water Program), conducted in March-April of 2003 and documented in Inspection Report No. 50-397/2003-002, identified the same electrical circuit vulnerabilities that were deferred to allow industry evaluation and resolution, and are not related to the portions of the program credited with aging management. Otherwise, the conclusions of the 2003 inspection were similar to the results of the 2006 inspection.

No NRC concerns or Columbia management concerns (through periodic audits, self-assessments, and heath reports) were identified with respect to inspection, testing, and maintenance of water-suppression portions of the Fire Protection System.

A search was performed of condition reports for the Fire Protection System. When conditions were found that required correction, they were evaluated in accordance with the corrective action program. A sampling of data forms for recording the results of the credited surveillance and test procedures were reviewed for recent monthly, semiannual, annual, and refueling interval inspections, flushes, and flow tests. Data forms for surveillances and tests that have a periodicity of every three years were also reviewed to cover the two most recent surveillances. Any deviations from the acceptance criteria were evaluated and corrected in accordance with the corrective action program. This review identified only minor issues not related to the effectiveness of the Fire Water Program or the aging effects under evaluation.

Conclusion

The Fire Water Program will detect and manage loss of material, as well as fouling, for susceptible components. The Fire Water Program, with the required enhancements, provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.27 Flexible Connection Inspection

Program Description

The Flexible Connection Inspection is a new one-time inspection that will detect and characterize the material condition of elastomer components that are exposed to treated water, dried air, gas, and indoor air environments. The inspection provides direct evidence as to whether, and to what extent, hardening and loss of strength due to thermal exposure and ionizing radiation has occurred or is likely to occur that could result in a loss of intended function of the elastomer components.

Implementation of the Flexible Connection Inspection will ensure that the pressure boundary integrity of susceptible components is maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Flexible Connection Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection,” with exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Parameters Monitored or Inspected, Detection of Aging Effects –**

  In addition to visual examination techniques, the Flexible Connection Inspection will include physical examination techniques, such as physical manipulation and prodding.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  A representative sample of components at susceptible locations will be examined for evidence of hardening and loss of strength (due to thermal exposure and ionizing radiation), or to confirm a lack thereof.

  The Flexible Connection Inspection focuses on a limited but representative sample population of subject components at susceptible locations to be defined in the implementing documents, to include internal and external surfaces of flexible connections exposed to treated water, dried air, gas, and indoor air environments. The inspections performed will be used to provide symptomatic evidence of hardening and loss of strength at the other susceptible, but possibly inaccessible, locations due to the similarities in materials and environmental conditions.

- Preventive Actions
  No actions are taken as part of the Flexible Connection Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Flexible Connection Inspection include visual evidence of surface degradation, such as cracking or discoloration, as well as physical manipulation and prodding, as measures of hardening and loss of strength. Inspections will be performed by qualified personnel using established techniques, such as NDE, consistent with the requirements of 10 CFR 50 Appendix B.

- Detection of Aging Effects
  The Flexible Connection Inspection will use established visual examination techniques (such as equivalent to VT-1 or VT-3), as well as physical manipulation, performed by qualified personnel on a sample population of subject components to identify evidence of hardening and loss of strength.

  The sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and design margins.

  The Flexible Connection Inspection will be conducted within the 10-year period prior to the period of extended operation.

- Monitoring and Trending
  This one-time inspection activity is used to characterize conditions and determine if, and to what extent, further actions may be required. The activity includes provisions for increasing the inspection sample size and location if degradation is detected.

  The sample size will be determined by engineering evaluation of the materials of construction, the environment (i.e., service conditions), aging effects, and operating experience (e.g., time in-service, most susceptible locations, lowest design margins). Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action process to determine the need for subsequent aging management activities and for monitoring and trending of the results.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective

action program to determine whether they could result in a loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Flexible Connection Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effect. The activity provides confirmation of conditions where degradation is not expected, has not evidenced as a problem, or where the aging mechanism is slow acting.

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  A review of Columbia operating experience to date has identified no issues for the flexible connections in the systems within the scope of this inspection. However, tears have been found in several suction and discharge boots (flexible connections) on air-handling units of the HVAC systems. The tears were attributed to normal operational wear; the boots remained pliable (i.e., no hardening) and no operability issues were identified. These flexible connections are included in the scope of the External Surfaces Monitoring Program.

  The site corrective action program and an ongoing review of industry operating experience will be used to ensure that a one-time inspection activity remains the appropriate method for managing the effects of aging for systems within the scope of this activity.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Flexible Connection Inspection will verify that there are no aging effects requiring management for the subject components or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions of the subject components will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.28 Flow-Accelerated Corrosion (FAC) Program

Program Description

The Flow-Accelerated Corrosion (FAC) Program will manage loss of material for steel and gray cast iron components located in the treated water environment (including steam, reactor coolant, closed cycle cooling water > 60C (140F), and treated water > 60C (140F)) of systems that are susceptible to flow-accelerated corrosion (FAC), also called erosion-corrosion.

The FAC Program is a condition monitoring program that ensures the integrity of piping systems susceptible to FAC is maintained. The program was developed in response to NRC Bulletin 87-01, "Thinning of Pipe Walls in Nuclear Power Plants," and NRC GL 89-08, "Erosion/Corrosion Induced Pipe Wall Thinning." The program follows the guidance and recommendations of EPRI NSAC-202L, "Recommendations for an Effective Flow-Accelerated Corrosion Program," and combines the elements of predictive analysis, inspections (to baseline and monitor wall-thinning), industry experience, station information gathering and communication, and engineering judgment to monitor and predict FAC wear rates.

NUREG-1801 Consistency

The FAC Program is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M17, "Flow-Accelerated Corrosion."

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Scope –**

  Add the Containment Nitrogen System components supplied with steam from the Auxiliary Steam System to the scope of the program.

  Add gray cast iron as a material identified as susceptible to FAC.

Operating Experience

The FAC Program is an ongoing program that has implemented the recommended actions of GL 89-08. The health of the program and corresponding systems are periodically reported, including material conditions. Industry operating experience has been, and continues to be, evaluated for impact to Columbia and for possible program enhancement. For example, based on review of INPO operating experience 14865, the program was enhanced to require evaluation of replacements for future inspection.

Periodic self assessments are also conducted. Gaps identified during the most recent self assessment have all been closed; and the FAC program plan was recently updated, with the current revision addressing all issues identified by the self assessment. In the last benchmark assessment, performed in March 2007, no issues or weaknesses were identified.

As a result, Columbia has programs and procedures in place, with operating experience demonstrating that the FAC Program is capable of detecting and managing loss of material due to FAC for susceptible components, and will continue to be an effective aging management program for the period of extended operation.

A review of program health reports, recent self-assessment reports, and related condition reports, demonstrates that the FAC Program is effective in detecting loss of material due to FAC for susceptible components, and defining the corrective actions (e.g., repair or replacement) necessary to assure their continued operation in accordance with design requirements.

Conclusion

The FAC Program will detect and manage loss of material due to FAC for susceptible components. The FAC Program, with the required enhancements, provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.29 Fuel Oil Chemistry Program

Program Description

The Fuel Oil Chemistry Program will mitigate the effects of aging for the storage tanks and associated components containing fuel oil that are within the scope of license renewal by verifying and maintaining the quality of the fuel oil used in the emergency diesel generators and the diesel-driven fire pumps. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material due to corrosion, or cracking due to SCC of susceptible copper alloys. through proper monitoring and control of fuel oil contamination consistent with plant Technical Specifications and American Society for Testing and Materials (ASTM) standards for fuel oil. The relevant conditions are specific contaminants such as water or microbiological organisms in the fuel oil that could lead to corrosion of susceptible materials. Exposure to these contaminants is minimized by verifying the quality of new fuel oil before it enters the storage tanks and by periodic sampling to ensure the tanks are free of water and particulates. The Fuel Oil Chemistry Program is a mitigation program.

The Fuel Oil Chemistry Program is supplemented by the Chemistry Program Effectiveness Inspection, which is a separate one-time inspection of representative areas of the diesel fuel oil system, such as low points where contaminants could accumulate. The one-time inspection provides further confirmation that loss of material, as well as cracking of susceptible copper alloys, is effectively mitigated or to detect and characterize whether, and to what extent, degradation is occurring.

NUREG-1801 Consistency

The Fuel Oil Chemistry Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M30, “Fuel Oil Chemistry,” with exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope –**

  The program does not include sampling or testing of new fuel for the diesel-driven fire pumps. Following the guidelines of ASTM standards, stored fuel is periodically sampled and tested.

- **Preventive Actions –**

  Preventive actions do not include the addition of biocides, stabilizers, or corrosion inhibitors to the fuel oil for the emergency diesel generators. The combination of ensuring the specified physical and chemical properties of new fuel oil, and periodic cleaning and draining of the storage tanks mitigates corrosion inside the tanks.

- **Parameters Monitored and Inspected –**

  The program does not include testing of the fuel oil used for the diesel-driven fire pumps for particulates. Sampling in accordance with ASTM standards D1796 and D4057 has proven adequate, based on the absence of related problems reported through the corrective action program.

- **Detection of Aging Effects –**

  Multi-level sampling of the fuel oil storage tanks is not performed; rather, a representative fuel stream sample is drawn from the flushing line during recirculation and transfer, consistent with ASTM D2276-93, step 4.3, laboratory filtration method.

Required Enhancements

None.

Operating Experience

The Fuel Oil Chemistry Program is an ongoing program that effectively incorporates the best practices and industry experience in controlling contaminant levels in fuel oil to minimize degradation. No instances of fuel oil system component failure due to contamination have been identified at Columbia.

With respect to the fuel oil tanks for the emergency diesel generators, review of Columbia operating experience reveals that the Fuel Oil Chemistry Program is adequately preventing a loss of component function of subject components that contain fuel oil. Fuel oil delivered to the site is sampled and analyzed prior to addition to the fuel oil storage tanks for the emergency diesel generators. Stored fuel oil is periodically sampled and analyzed for both the emergency and fire protection diesel generators. Water is removed from the stored fuel oil and particulates are filtered. In addition, visual and ultrasonic inspection of an emergency diesel generator fuel oil storage tank, as listed in FSAR Section 9.5.4.4.a, revealed acceptable conditions for the tank internal surfaces; that is, only light corrosion in previously identified areas with no material loss or obvious changes to the condition of the tank.

The fuel oil tanks for the diesel-driven fire pumps are also periodically sampled and analyzed. Water is removed and particulates are filtered based on condition (e.g., when unacceptable levels during periodic sampling necessitate cleaning of the fuel oil). Review of Columbia operating experience reveals that the Fuel Oil Chemistry Program is adequately preventing a loss of component function of subject components that contain fuel oil. Quarterly sampling of the fuel oil tanks for the diesel-driven fire pumps has been effective at identifying unacceptable levels of water and sediment prior to a loss of function. Higher than expected amounts of water or sediment during periodic sampling has resulted in cleaning of the tanks and filtering of the fuel to restore acceptable conditions. The periodic cleaning and filtering has included the addition of a biocide due to evidence of biofouling.

To meet new Environmental Protection Agency requirements, Columbia will be transitioning to Ultra-Low-Sulfur Diesel (ULSD) fuel prior to the period of extended operation. ULSD fuel and its possible adverse impacts on diesel performance are addressed in NRC Information Notice 2006-022. The impact of using ULSD fuel on the Columbia design and licensing basis has been evaluated, including the consideration of related operating experience from the industry, and corrective actions assigned to account for the future transition. Columbia will provide notification of any changes to the Fuel Oil Chemistry Program as a result of the transition to ULSD fuel.

Conclusion

The Fuel Oil Chemistry Program will manage loss of material and cracking for susceptible components through monitoring and control of contaminants in the fuel oil. The Fuel Oil Chemistry Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.30 Heat Exchangers Inspection

Program Description

The Heat Exchangers Inspection is a new one-time inspection that will detect and characterize the surface conditions with respect to fouling of heat exchangers and coolers that are in the scope of the inspection and exposed to indoor air or to water with the chemistry controlled by the BWR Water Chemistry Program or the Closed Cooling Water Chemistry Program. The inspection provides direct evidence as to whether, and to what extent, a reduction of heat transfer due to fouling has occurred or is likely to occur on the heat transfer surfaces of heat exchangers and coolers.

Implementation of the Heat Exchangers Inspection will provide assurance (and confirmation) that the heat transfer capabilities of heat exchangers and coolers in the scope of the inspection will be maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Heat Exchangers Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Heat Exchangers Inspection includes measures to verify that unacceptable reduction in heat transfer is not occurring for the stainless steel and copper alloy heat transfer surfaces of the following heat exchangers and coolers that are in the scope of license renewal, but are not cooled by raw water:

  - Diesel Cooling Water (DCW) lube oil coolers and jacket water heat exchangers
  - Diesel (Engine) Exhaust (DE) turbocharger aftercooler
  - Diesel Lubricating Oil (DLO) lube oil cooler
  - Fuel Pool Cooling (FPC) heat exchangers
  - Reactor Core Isolation Cooling (RCIC) lube oil cooler

- Residual Heat Removal (RHR) heat exchanger
- RHR pump seal coolers
- Reactor Recirculation (RRC) pump seal coolers
- Radwaste Building Mixed Air (WMA) heat exchangers

A representative sample of heat exchanger and cooler surfaces that are exposed to treated water, closed cooling water, and indoor air will be examined for evidence of a reduction in heat transfer capabilities due to fouling, or to confirm a lack thereof, with engineering evaluation of the results.

- Preventive Actions
  No actions are taken as part of the Heat Exchangers Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Heat Exchangers Inspection include visual or volumetric evidence of surface fouling as a measure of reduction in heat transfer capabilities. Inspections will be performed by qualified personnel using established NDE techniques.

- Detection of Aging Effects
  The Heat Exchangers Inspection will use visual examination techniques (VT-3 or equivalent) performed by qualified personnel on a sample population of the heat exchangers and coolers within the scope of the inspection to identify evidence of fouling on heat transfer surfaces, or to confirm a lack thereof.

  The sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and the lowest design margins with respect to heat transfer.

  The Heat Exchangers Inspection activities will be conducted within the 10-year period prior to the period of extended operation.

- Monitoring and Trending
  This one-time inspection activity is used to characterize conditions and determine if, and to what extent, further actions may be required. The activity includes increasing the inspection sample size and location if degradation is detected.

  Sample size will be determined by engineering evaluation of the materials of construction, environment (i.e., service conditions), aging effects, and operating experience (e.g., time in-service, most susceptible locations, lowest design margins).

Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action process to determine the need for subsequent aging management activities and for monitoring and trending of the results.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Heat Exchangers Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effect.

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  A review of Columbia operating experience to date has identified no issues for the heat exchangers in the systems within the scope of this inspection. The site corrective action program and an ongoing review of industry operating experience will be used to ensure that a one-time inspection activity remains the appropriate method for managing the effects of aging for systems within the scope of this activity.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Heat Exchangers Inspection will verify that reduction in heat transfer does not require management for the subject components, or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.31 High-Voltage Porcelain Insulators Aging Management Program

Program Description

The High-Voltage Porcelain Insulators Aging Management Program will manage the build-up of contamination (hard water residue) deposited on the in-scope high-voltage insulators in the transformer yard by the vapor plume from the Circulating Water System cooling towers. This residue, in conjunction with unfavorable weather conditions (moisture from the plume and freezing temperatures), has caused electrical flashovers on the 500-kV bus pedestal insulators in the transformer yard.

The High-Voltage Porcelain Insulators Aging Management Program is a preventive maintenance program consisting of activities to mitigate potential degradation of the insulation function due to hard water deposits.

Note: There are no station post insulators in the 230-kV system located in the transformer yard.

NUREG-1801 Consistency

The High-Voltage Porcelain Insulators Aging Management Program is an existing Columbia program that is plant-specific. There is no corresponding aging management program described in NUREG-1801, therefore, the program elements are compared to the elements listed in Table A.1-1 of NUREG-1800.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The High-Voltage Porcelain Insulators Aging Management Program is credited for managing the build-up of hard water residue on the in-scope high-voltage insulators (located in the transformer yard) deposited by the vapor plume from the Circulating Water System cooling towers.

  The High-Voltage Porcelain Insulators Aging Management Program involves the following equipment:

  - The high-voltage station post insulators between the 115-kV backup transformer (E-TR-B) and circuit breaker E-CB-TRB.

  The 500-kV insulators, which experienced the flashover events in the past, are not within the scope of license renewal.

- Preventive Actions
  The actions of the High-Voltage Porcelain Insulators Aging Management Program are a preventive maintenance activity that mitigates (retards) degradation of the insulation function.

  The High Voltage Porcelain Insulators Aging Management Program provides for either the periodic coating or cleaning of the applicable high-voltage insulators. Cleaning every two years is performed to prevent the build-up of hard water residue on the insulator surface to a point that could cause an electrical flashover. Coating every 10 years prevents the harmful effect of a hard water residue build-up on the insulators. Cleaning is not required if the insulator is coated.

- Parameters Monitored or Inspected
  The High-Voltage Porcelain Insulators Aging Management Program visually inspects coated insulators every two years for damage. Uncoated insulators are inspected every two years for any unusual conditions.

- Detection of Aging Effects
  The High-Voltage Porcelain Insulators Aging Management Program is a preventative maintenance program that does not have any specific steps to detect hard water residue on the insulators leading to flashover. The program assumes that the residue exists and takes steps to limit its effect (via coating) or to remove it (via cleaning). A visual inspection of the insulator is specified to note any excessive degradation or excessive surface contamination. The in-scope insulators are inspected and cleaned every two years. Cleaning is not required if the insulators are coated. If insulators are coated, the coating is performed every 10 years.

- Monitoring and Trending
  The High-Voltage Porcelain Insulators Aging Management Program does not include trending actions. The High-Voltage Porcelain Insulators Aging Management Program is a preventive maintenance program that is performed at established intervals to coat or clean the in-scope insulators. If during the inspection of the coating or in preparation for cleaning uncoated high-voltage porcelain insulators, significant or unusual or unexpected hard water residue build-up is noted (i.e., excessive deposits), the inspection results will be evaluated through the corrective action program. The corrective action evaluation may result in analysis or further inspection, and a disposition is generated. This disposition may result in a change in the frequency of inspection.

- Acceptance Criteria
  The High-Voltage Porcelain Insulators Aging Management Program is a preventive maintenance activity that is periodically performed on specific in-scope equipment. There are no defined acceptance criteria; hard water deposits are assumed to occur and the activity is designed to limit their impact on the insulators. For the visual

inspection of the insulators, excessive surface contamination that does not wash off (i.e., obvious degradation on the insulator) is unacceptable. Such degradation is not expected to be seen on the porcelain material.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The elements that comprise the High-Voltage Porcelain Insulators Aging Management Program are consistent with industry practice and have proven effective in maintaining the high-voltage porcelain insulators free from the adverse effects of hard water residue build-up.

  A review of the most recent operating experience for the high-voltage porcelain insulator inspections reveals that the inspections are performed in accordance with procedure, the results are documented and retrievable, and if any abnormalities are identified during inspection, corrective actions are taken. A review of plant-specific operating experience for the most recent five-year period, through a search of condition reports, revealed that no 115-kV or 230-kV output breakers tripped as a result of high currents created when a porcelain insulator in the transformer yard shorted to ground.

  The incidents which alerted the plant to the hard water deposition on the 500-kV insulators are described in Licensee Event Reports 89-002-00 and 90-031. It is noted that these events occurred almost 20 years ago. There is industry operating experience of similar flashover events occurring at plants on the ocean affected by salt spray (Brunswick, Crystal River 3, and Pilgrim), and also plants affected by heavy fog and contamination deposits on high-voltage insulators (River Bend).

Required Enhancements

None.

Conclusion

The High-Voltage Porcelain Insulators Aging Management Program will manage the hard water residue build-up on the in-scope high-voltage insulators in the transformer yard. The continued implementation of the High-Voltage Porcelain Insulators Aging Management Program provides reasonable assurance that the effects of aging will be managed such that components subject to aging management will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.32 Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program

Program Description

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program will manage the aging of inaccessible medium-voltage electrical cables that are not environmentally qualified and subject to wetting within the scope of license renewal. The program provides for the periodic testing of non-environmentally qualified inaccessible medium-voltage electrical cables, in order to determine if age-related degradation is occurring, and includes a provision for the inspection of associated manholes to identify any collection of water. The program will provide reasonable assurance that the electrical components will continue to perform their intended functions for the period of extended operation.

Energized medium-voltage cables (defined as 2kV to 35kV) that are exposed to wetting (standing water or condensation) in inaccessible locations are vulnerable to loss of dielectric strength and a degradation mechanism known as water treeing. The formation of water trees (gradients or tracks in the insulation) can lead to electrical failure. An inaccessible location may be a conduit, a cable trench, a duct bank, an underground vault, or a direct-buried installation.

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program is a new aging management program that will be implemented prior to the period of extended operation, with the cable testing portion to be performed every 10 years thereafter, and the manhole inspection portion to be performed at least every two years thereafter.

NUREG-1801 Consistency

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program is a new Columbia program that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.E3, “Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements”.

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program involves two parts: first, the actions to inspect the plant manholes (and to drain them, if necessary) on a periodic basis; and second, the development of a testing program to confirm that the conductor insulation on the cables is not degrading.

  This program applies to medium-voltage cables within the scope of license renewal that meet the criteria of an inaccessible location, exposure to wetting, and exposure to significant voltage. Significant moisture is defined as periodic exposure to moisture that lasts more than a few days (e.g., cables in standing water). Periodic exposure to moisture that lasts less than a few days (i.e., normal rain and drain) is not significant. Significant voltage exposure is defined as being subject to system voltage for more than twenty-five percent of the time.

- Preventive Actions
  The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program will include periodic preventive actions to inspect for water collection in electrical manholes, and to remove water (as necessary).

- Parameters Monitored or Inspected
  The specific type of test to be utilized in the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program will be determined prior to the initial test. The implementing documents will specify a proven test (such as power factor, partial discharge, or polarization index, as described in EPRI TR-103834-P1-2) for detecting the deterioration of the insulation system due to wetting (and energization), and will reflect the actual test methodology prior to the initial performance of the cable testing. In addition, the provisions for inspecting and draining (if necessary) the electrical manholes will be described in the implementing documents.

- Detection of Aging Effects
  The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program will provide for the testing of in-scope medium-voltage cables to detect degradation of the conductor insulation. The program will utilize a proven test for detecting deterioration of the cable insulation due to wetting (and energization). The program will also conduct inspections of the electrical manholes to detect water collection and to drain the manholes (if necessary).

  The cable testing will be performed at least once every 10 years, with the first test to occur during the 10-year period prior to the end of the current operating license. The inspections for water collection will be performed based on actual plant operating experience with water accumulation in the manholes. However, the inspection frequency will be at least once every two years. The first inspections will occur during the 10-year period prior to the end of the current operating license.

- Monitoring and Trending
  The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program will not include trending actions. If anomalies are found during the testing, they will be addressed at that time under the corrective action program. The results of the manhole inspections will be recorded such that increasing water levels, or the need for more frequent performance of draining, can be identified.

- Acceptance Criteria
  The acceptance criteria for each test in the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program will be defined by the specific type of test to be performed. The type of test will be determined prior to the initial utilization of the program. The implementing documents will contain specific information on the acceptance criteria for each test.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

  In addition, for the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program, an engineering evaluation is performed when the test acceptance criteria are not met in order to ensure that the intended functions of the electrical cables can be maintained consistent with the current licensing basis. Such an evaluation will consider the significance of the test results, the operability of the component, the reportability of the event, the extent of the concern, the potential root causes for not meeting the test acceptance criteria, the corrective actions required, and the likelihood of recurrence. When an unacceptable condition or situation is identified, a determination will be made as to whether the same condition or situation is applicable to other inaccessible, in-scope medium-voltage cables.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program is a new program for which there is no site-specific operating experience. Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

  Plant operating experience has shown that the corrective action program has addressed issues of cable degradation in recent years. Control cables, instrument cables, and low-voltage power cables have been identified with degraded insulation, primarily as a result of exposure to excessive localized overheating. There have been no failures of cables directly attributed to water treeing. Columbia has not experienced any degradation failures of medium-voltage cables. However, two 480-V power cables have failed due to damage incurred during installation and subsequent moisture intrusion. One medium-voltage cable failed because it exceeded its ampacity rating.

  Recent inspections of medium-voltage manholes identified two manholes adjacent to the cooling towers with standing water. The source of water has not been determined. This is a current licensing basis issue, and the corrective action program will be used to determine the source, to correct or mitigate the problem, and to determine the future inspection frequency needed based on the cause and the corrective actions taken. A search of plant operating experience identified no other cases of medium-voltage manholes having water intrusion. Industry operating experience will be considered in the development of this program.

Required Enhancements

Not applicable, this is a new program.

Conclusion

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program will manage degradation of conductor insulation for inaccessible, non-environmentally qualified medium-voltage cables. The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Program will provide reasonable assurance that the aging effects will be managed such that the inaccessible, non-environmentally qualified medium-voltage cables subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.33 Inservice Inspection (ISI) Program

Program Description

The Inservice Inspection (ISI) Program manages cracking due to SCC/IGA and flaw growth of reactor coolant system pressure boundary components made of nickel alloy, stainless steel (including cast austenitic stainless steel), and steel (including steel with stainless steel cladding), including the reactor vessel, a limited number of internals components, and the reactor coolant system pressure boundary. The Inservice Inspection (ISI) Program also manages loss of material due to corrosion for reactor vessel internals components and reduction of fracture toughness due to thermal embrittlement of cast austenitic stainless steel pump casings and valve bodies.

The Columbia Inservice Inspection (ISI) Program meets the requirements of ASME Section XI. The Columbia Inservice Inspection (ISI) Program details the requirements for the examination, testing, repair, and replacement of components specified in ASME Section XI for Class 1, 2, or 3 components. The Columbia Inservice Inspection (ISI) Program complies with the ASME Code requirements, and is therefore consistent with the NUREG-1801 program. The program is described in FSAR Section 5.2.4 and is implemented by various plant procedures.

The Columbia program scope has been augmented to include additional requirements, and components, beyond the ASME requirements. Examples include the augmentation of ISI to expanded reactor vessel feedwater nozzle examinations, examinations of high energy line piping systems that penetrate containment, and examinations per Generic Letter 88-01. Such augmentation is consistent with the ISI program description in NUREG-1801, Section XI.M1.

The Columbia Inservice Inspection (ISI) Program contains a Risk-Informed Inservice Inspection (RI-ISI) program for Class 1 piping, based on EPRI Topical Report TR-112657 Revision B-A, which has been approved by the NRC staff. The RI-ISI provides alternate inspection requirements for a subset of Class 1 piping welds. The staff’s review of the RI-ISI program for the third ISI 10-year interval concluded that the program is an acceptable alternative to the current ISI program based on the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI requirements for Class 1, non-socket Category B-J welds. While this varies from the ASME Code, it represents a modernization of the Code that has been accepted by the NRC for use at many nuclear power plants, including Columbia. Because of the widespread NRC acceptance of Risk-Informed ISI, this is not considered an exception to NUREG-1801.

Evaluation of flaws in accordance with established site procedures using ASME Code and BWRVIP requirements may result in re-inspection or sample expansion.

The Columbia Inservice Inspection (ISI) Program evaluates examination results in accordance with the requirements of Section XI, IWB-3000, Standards for Examination Evaluations. Acceptance of components for continued service is in accordance with the ASME Code or the BWRVIP program guidance, as applicable.

The Columbia program sizes cracks in accordance with the requirements of the ASME Code, Section XI. Additionally, BWRVIP documents, such as BWRVIP-14, BWRVIP-59, and BWRVIP-60, are used for crack growth, where appropriate.

Inspection results are recorded every operating cycle and provided to the NRC after each refueling outage via the Owner's Reports, prepared by the ISI program coordinator.

NUREG-1801 Consistency

The Inservice Inspection (ISI) Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

Industry Experience:

> NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.
>
> Review of recent License Renewal Applications shows that other applicants are using standard ISI inspection techniques and finding and repairing indications prior to any loss of intended function.

Columbia operating experience:

> Recent Columbia operating experience related to inservice inspection is documented in Inservice Inspection Outage Summary Reports. Specific examples of ISI findings are also documented in condition reports. Columbia operating experience is consistent with industry experience; a large number of examinations are being performed, and indications are found and resolved. An occasional repair is being performed prior to loss of intended function. The extensive site-specific operating experience with the ASME Inservice Inspection program provides assurance that the program is effective in managing the effects of aging so that components crediting this program can perform their intended functions consistent with the current licensing basis during the period of extended operation.

The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program remains effective in managing the identified aging effects.

Conclusion

The Inservice Inspection (ISI) Program manages cracking for components of the reactor coolant pressure boundary, including the reactor vessel, vessel internals, piping, and valves, manages reduction of fracture toughness of cast austenitic stainless steel pump casings and valve bodies, and manages loss of material for components of the vessel internals. The Inservice Inspection (ISI) Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.34 Inservice Inspection (ISI) Program – IWE

Program Description

The Inservice Inspection (ISI) Program – IWE establishes responsibilities and requirements for conducting IWE inspections as required by 10 CFR 50.55a. The ISI Program – IWE includes visual examination of all accessible surface areas of the steel containment and its integral attachments and containment pressure-retaining bolting in accordance with the requirements of the ASME Code, Section XI, 2001 Edition through 2003 Addenda for Subsection IWE.

The in-service examinations conducted throughout the service life of Columbia will comply with the requirements of the ASME Code Section XI Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the inspection interval, subject to prior approval of the edition and addenda by the NRC. This is consistent with NRC statements of consideration associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

The ISI Program – IWE provides reasonable assurance that the effects of aging are adequately managed to assure that the Primary Containment intended function is performed consistent with the current licensing basis for the period of extended operation.

NUREG-1801 Consistency

The ISI Program – IWE is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S1, “ASME Section XI, Subsection IWE”.

The ISI Program – IWE is performed under the Columbia Inservice Inspection (ISI) program. The ISI program is implemented largely to meet the rules and requirements of the ASME Section XI Code. The NUREG-1801 XI.S1 aging management program evaluation has specifically included the Code year (e.g., 2001 edition including the 2002 and 2003 Addenda), as endorsed by the NRC in 10 CFR 50.55a.

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Columbia containment examinations and tests required by the ISI Program – IWE have been implemented in accordance with the established schedule. All the examinations scheduled for the first and second inspection ISI intervals have been completed. All of these examinations and tests performed to date have satisfied the acceptance standards contained within Article IWE-3000, without exception. Currently, there are no containment surfaces or components requiring designation as augmented examination areas. Columbia's Mark II containment is inerted with nitrogen, which provides an atmosphere that is not conducive to corrosion of containment interior surfaces. ISI third interval first period Refueling Outage 18 (R18) also satisfied the acceptance standards contained within Article IWE-3000. Two bolting related defects were found during the IWE inspection and were reported in the R18 ISI summary report, one was related to a bolt for the drywell head and the other for a bolt on the equipment hatch. Both bolt and nut sets were replaced and subsequently pressure tested to confirm pressure boundary integrity of the joint. Inservice inspection records are maintained in accordance with Article IWA 6340 and are maintained in the permanent plant file storage.

The health of the ISI program is reported periodically in terms of performance indicators. The program health reports for 2007 and 2008 indicated no age-related concerns for systems and components within the scope of the ISI Program – IWE. Review of plant operating experience did not reveal containment integrity issues with regards to containment components pertaining to ASME Section XI, Subsection IWE.

The suppression pool wetted surfaces of the submerged areas were examined and found acceptable.

The NRC issued a request for additional information (RAI) on drywell degradation to Columbia in December 1987, since it is the only Mark II plant design with a steel containment and because design features, which contribute to drywell shell corrosion in Mark I containments appear to exist at Columbia. Degradation of the drywell for Mark I containments, due to moisture or water in the sand pockets, is the topic of Generic Letter 87-05. For license renewal, this same topic is the subject of interim staff guidance, with respect to the considerations for aging management during the period of extended operation. Columbia provided a response to the above RAI in February 1988. This response described the pathways through which water could enter the air gap between the steel containment and the shield building, the compressible materials separating the containment and shield wall, and the assessment of the conditions of the containment annulus sand pocket and associated draining system.

Due to the possibility of containment shell degradation from corrosion induced by a moist environment in the sand pocket region, Columbia has committed to monitor humidity levels in this region. Columbia has implemented a procedure to survey the relative humidity of air drawn from within the containment annulus sand pocket region. Review of past inspection results revealed that inspections performed were satisfactory and surveillances since late 1989 indicate no water has been detected; and that there is no evidence of leakage into the sand pocket region. Measurement of sand pocket area humidity provides assurance that water is not accumulating in the sand pocket area, which could cause corrosion of the outer containment shell.

The ISI Program – IWE has been effective in managing the identified aging effects. The site corrective action program and ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The Inservice Inspection (ISI) Program – IWE will be capable of detecting and managing loss of material for the steel surfaces of the containment. The continued implementation of the Inservice Inspection (ISI) Program – IWE provides reasonable assurance that the aging effects will be managed such that the structures and components will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.2.35 Inservice Inspection (ISI) Program – IWF

Program Description

The Inservice Inspection (ISI) Program – IWF establishes responsibilities and requirements for conducting IWF inspections as required by 10 CFR 50.55a. The ISI Program – IWF includes visual examination for supports based on sampling of the total support population. The sample size varies depending on the ASME Class. The largest sample size is specified for the most critical supports (ASME Class 1 and those other than piping supports (Class 1, 2, 3, and MC)). The sample size decreases for the less critical supports (ASME Class 2 and 3). Discovery of support deficiencies during regularly scheduled inspections triggers an increase of the inspection scope, in order to ensure that the full extent of deficiencies is identified. The primary inspection method employed is visual examination. Degradation that potentially compromises support function or load capacity is identified for evaluation. IWF specifies acceptance criteria and corrective actions. Supports requiring corrective actions are re-examined during the next inspection period in accordance with the requirements of the ASME Code, Section XI, 2001 Edition through 2003 Addenda for Subsection IWF.

The in-service examinations conducted throughout the service life of Columbia will comply with the requirements of the ASME Code Section XI, Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the inspection interval, subject to prior approval of the edition and addenda by the NRC. This is consistent with NRC statements of consideration associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

The ISI Program – IWF provides reasonable assurance that the effects of aging are adequately managed to assure that the Class 1, 2, and 3 component supports intended function is performed consistent with the current licensing basis for the period of extended operation.

NUREG-1801 Consistency

The ISI Program – IWF is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S3, “ASME Section XI, Subsection IWF”.

The ISI Program – IWF is performed under the Columbia Inservice Inspection (ISI) program. The ISI program is implemented largely to meet the rules and requirements of the ASME Section XI Code. The NUREG-1801 XI.S3 aging management program evaluation specifically includes the Code year (e.g., 2001 edition including the 2002 and 2003 Addenda), as endorsed by the NRC in 10 CFR 50.55a.

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

The ISI Program – IWF refueling outage 18 (R-18) inspection identified non aging-related degradation such as a spring can setting out of tolerance. This deficiency was further evaluated and accepted in accordance with the ISI program. Another deficiency found was one of the 1/2 inch bolts holding the installed shims in place sheared at a reactor pressure vessel (RPV) stabilizer. An engineering evaluation determined that the condition of the RPV stabilizer is acceptable. A condition report documents the discovery of this sheared bolt. Only one of the two 1/2 inch diameter bolts provided for shim restraint on each side is damaged (i.e., the upper bolt on the right hand side) and the associated shims are not dislodged, the condition does not affect the overall functionality of the RPV stabilizer. The damaged bolt was replaced during refueling outage 19 (R-19).

Examinations were conducted of 100 percent of the locations specified in the program. There were two Code-related successive inspections required to be performed per Subsection IWF during the third interval first inspection period. These inspections, one on a snubber and one on a spring support, were performed during the R-19 outage and the results were acceptable.

The health of the ISI program is reported periodically in terms of performance indicators. The program health reports for 2007 and 2008 indicated no age-related concerns for systems and components within the scope of the ISI Program – IWF. Review of the three previous Refueling Outage (R-18, R-17, and R-16) ISI summary reports and plant operating experience did not reveal age-related issues with regards to ASME Class 1, 2, 3, and MC supports pertaining to ASME Section XI, Subsection IWF.

The ISI Program – IWF has been effective in managing the identified aging effects. The site corrective action program and ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The Inservice Inspection (ISI) Program – IWF will be capable of detecting and managing loss of material and cracking for ASME Class 1, 2, and 3 component supports. The continued implementation of the Inservice Inspection (ISI) Program – IWF provides reasonable assurance that aging effects will be managed such that the structures and components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.36 Lubricating Oil Analysis Program

Program Description

The Lubricating Oil Analysis Program will mitigate the effects of aging for plant components that are within the scope of license renewal and exposed to a lubricating oil environment. The program ensures that the oil environment in the mechanical systems is maintained to the required quality. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material due to crevice, galvanic, general, or pitting corrosion or selective leaching, or reduction in heat transfer due to fouling, through monitoring of the lubricating oil consistent with manufacturer's recommendations and industry standards. The relevant conditions are specific parameters including particulate and water content, viscosity, neutralization number, and flash point that are indicative of conditions that could lead to age-related degradation of susceptible materials. The Lubricating Oil Analysis Program is a mitigation program.

The Lubricating Oil Analysis Program is supplemented by a one-time inspection of representative areas of lubricating oil systems under the Lubricating Oil Inspection to provide confirmation that loss of material and fouling are effectively mitigated.

NUREG-1801 Consistency

The Lubricating Oil Analysis Program is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M39, "Lubricating Oil Analysis."

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Scope –**

  Include the following Fire Protection System components that are exposed to lubricating oil within the scope of the program: (1) fire protection diesel engine heat exchangers (lube oil coolers), (2) fire protection diesel engine lube oil piping, and (3) fire protection diesel engine lube oil pump casings.

Operating Experience

The Lubricating Oil Analysis Program is an ongoing program that effectively incorporates the best practices of the industry. Manufacturer recommendations and industry standards are used to establish quality requirements for lubricating oil. The program incorporates the results of operating experience from Columbia and from other utility and industry sources. The program has been, and continues to be, subject to periodic internal and external assessment of the performance to identify strengths and areas for improvement.

Review of Columbia operating experience did not reveal a loss of component intended function for components exposed to lubricating oil that could be attributed to an inadequacy of the Lubricating Oil Analysis Program. Abnormal lubricating oil conditions are promptly identified, evaluated, and corrected. For example, lubricating oil in the feedwater turbine has previously been found contaminated with water. The Lubricating Oil Analysis Program evaluated the condition, determined the source of the water through sampling and analysis, and initiated corrective action. The lubricating oil was replaced and the source of the water leakage was repaired. In addition, levels of lead in emergency diesel generator lube oil have been found that exceeded the specified limits and showed an increasing trend. The evaluation determined the source to be soldered joints on the lube oil coolers. A planned replacement of the oil coolers with a different design was already in place at the time the source was determined, and the coolers have since been replaced.

Conclusion

The Lubricating Oil Analysis Program will manage loss of material and reduction in heat transfer for susceptible components in lubricating oil, through monitoring of the relevant parameters. The Lubricating Oil Analysis Program, with the required enhancements, and supplemented by the Lubricating Oil Inspection prior to entering the period of extended operation provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.37 Lubricating Oil Inspection

Program Description

The Lubricating Oil Inspection is a new one-time inspection that will detect and characterize the condition of materials in systems and components for which the Lubricating Oil Analysis Program (a mitigation program) is credited with aging management. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, galvanic, general, or pitting corrosion or selective leaching, or reduction in heat transfer due to fouling, has occurred on surfaces exposed to lubricating oil.

Implementation of the Lubricating Oil Inspection will provide additional confirmation of Lubricating Oil Analysis Program effectiveness and further assurance that the intended functions of susceptible components will be maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Lubricating Oil Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI. M32, "One-Time Inspection."

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Lubricating Oil Inspection includes the oil-wetted surfaces of aluminum, aluminum alloy, copper alloy, copper alloy > 15% Zn, steel, gray cast iron, and stainless steel components in the following license renewal systems:

  - Control Rod Drive (CRD) System
  - Control Room Chilled Water (CCH) System
  - Diesel Cooling Water (DCW) System
  - Diesel Engine Starting Air (DSA) System
  - Diesel Exhaust (DE) System
  - Diesel Generators (DG) System

- Diesel Lubricating Oil (DLO) System
- Fire Protection (FP) System
- Low Pressure Core Spray (LPCS) System
- Reactor Core Isolation Cooling (RCIC) System
- Standby Service Water (SW) System

A representative sample of components, with special emphasis on locations that may be susceptible to the collection of entrained water, will be examined for evidence of loss of material (due to crevice, galvanic, general, or pitting corrosion or selective leaching) or reduction in heat transfer due to fouling, or to confirm a lack thereof, and the results applied to all of the systems and components within the scope of the inspection, based on engineering evaluation.

- Preventive Actions
  No actions are taken as part of the Lubricating Oil Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Lubricating Oil Inspection include wall thickness and visual evidence of internal or external surface degradation as measures of a loss of material or fouling. Inspections will be performed by qualified personnel using established NDE techniques.

- Detection of Aging Effects
  The Lubricating Oil Inspection will use a combination of established volumetric and visual examination techniques and nondestructive methods performed by qualified personnel on a sample population of subject components to identify evidence of loss of material or fouling or to confirm a lack thereof.

  The sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, will focus on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and design margins.

  The Lubricating Oil Inspection will be conducted within the 10-year period prior to the period of extended operation.

- Monitoring and Trending
  No actions are taken as part of the Lubricating Oil Inspection to monitor or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions, including monitoring and trending, may be required.

Sample size will be determined by engineering evaluation, as described for the *Parameters Monitored or Inspected* element above. Results of inspection activities that require further evaluation and resolution (e.g., if degradation is detected), if any, will be evaluated using the Columbia corrective action process, including expansion of the sample size and inspection locations to determine the extent of the degradation.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Lubricating Oil Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effects. The activity provides confirmation of conditions where degradation is not expected, has not evidenced as a problem, or where the aging mechanism is slow acting. Inspection methods are to be consistent with accepted industry practices.

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  A review of Columbia operating experience to date has identified no instances of age-related degradation in lubricating oil environments. The site corrective action program and an ongoing review of industry operating experience will be used to ensure that a one-time inspection activity remains the appropriate method for managing the effects of aging for systems within the scope of this activity.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Lubricating Oil Inspection will verify that there are no aging effects requiring management for the subject components or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.38 Masonry Wall Inspection

Program Description

The Masonry Wall Inspection is an existing condition monitoring program consisting of inspection activities to detect aging and age-related degradation for masonry walls identified as performing intended functions in accordance with 10 CFR 54.4. Masonry walls that perform a fire barrier intended function are also managed by the Fire Protection Program.

The Masonry Wall Inspection is implemented as part of the Structures Monitoring Program conducted for the Maintenance Rule.

Aging effects identified within the scope of the Masonry Wall Inspection are detected by visual inspection of external surfaces prior to the loss of the structure's or component's intended functions. Masonry walls are visually examined at a frequency selected to ensure there is no loss of intended function between inspections and that the evaluation basis established for each masonry wall within the scope of license renewal remains valid through the period of extended operation.

NUREG-1801 Consistency

The Masonry Wall Inspection is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S5, "Masonry Wall Program."

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program elements:

- **Parameters Monitored or Inspected, Acceptance Criteria –**

  Specify that for each masonry wall, the extent of observed masonry cracking or degradation of steel edge supports and bracing are evaluated to ensure that the current evaluation basis is still valid. Corrective action is required if the extent of masonry cracking or steel degradation is sufficient to invalidate the evaluation basis. An option is to develop a new evaluation basis that accounts for the degraded condition of the wall (i.e., acceptance by further evaluation).

Operating Experience

The Masonry Wall Inspection includes all masonry walls identified in accordance with 10 CFR 54.4. This includes masonry walls in the Circulating Water Pump House, Turbine Generator Building, and the NSR portion of the Radwaste Control Building. There are no safety-related masonry walls at Columbia. Some removable shielding block walls are installed between steel plates in the proximity of Class 1 piping in the Reactor Building. These shield walls have been evaluated to assure that they could withstand a combination dead load plus seismic load resulting from a safe shutdown earthquake.

The Masonry Wall Inspection has been effective in managing the identified aging effects. Visual examinations conducted by the Masonry Wall Inspection, as implemented by the Structures Monitoring Program, have not found any age-related problems or degraded conditions for masonry walls that could affect their intended function.

Therefore the Masonry Wall Inspection, as implemented by the Structures Monitoring Program, has provided reasonable assurance that aging effects are being managed.

The site corrective action program and ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The Masonry Wall Inspection with enhancement, as part of the Structures Monitoring Program, will be capable of detecting and managing aging effects for the masonry walls within the scope of license renewal. The continued implementation of the Masonry Wall Inspection, with the required enhancement, provides reasonable assurance that the effects of aging will be managed so that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.39 Material Handling System Inspection Program

Program Description

The Material Handling System Inspection Program is credited with managing loss of material for cranes (including bridge, trolley, rails, and girders), monorails, and hoists within the scope of license renewal. The Material Handling System Inspection Program is based on guidance contained in ANSI B30.2 for overhead and gantry cranes, ANSI B30.11 for monorail systems and underhung cranes, and ANSI B30.16 for overhead hoists. The inspections monitor structural members for signs of corrosion and wear. The inspections are performed periodically for installed cranes and hoists (e.g., annually for the reactor building crane, other NUREG-0612 heavy load handling systems and the refueling platform).

The Material Handling System Inspection Program provides reasonable assurance that the effects of aging are adequately managed for Columbia cranes (including bridge, trolley, rails, and girders), monorails, and hoists and that their intended function will continue to be performed consistent with the current licensing basis for the period of extended operation.

NUREG-1801 Consistency

The Material Handling System Inspection Program is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems.”

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancement listed below will be implemented in the identified program element:

- **Detection of Aging Effects –**

  Ensure jib cranes and electrically operated hoists are visually inspected for corrosion.

Operating Experience

A review of crane and hoist inspections previously conducted at Columbia and of industry operating experience confirms the acceptability of the inspections and their frequency in that degradation of cranes (including bridge, trolley, rails, and girders), monorails, and hoists was detected prior to loss of function. Related crane and hoist inspections have found no age-related degradation problems.

The health of the Material Handling System Inspection Program is reported periodically in terms of performance indicators. The program health reports for 2007 and 2008 noted no age-related improvements for the program.

The Material Handling System Inspection Program has been effective in managing the identified aging effects. The site corrective action program and ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The Material Handling System Inspection Program will be capable of detecting and managing loss of material for cranes (including bridge, trolley, rails, and girders), monorails, and hoists within the scope of license renewal. The continued implementation of the Material Handling System Inspection Program, with the required enhancement, provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.40 Metal-Enclosed Bus Program

Program Description

The Metal-Enclosed Bus Program will manage the aging of metal-enclosed bus within the scope of license renewal. The program provides for the periodic visual inspection of metal-enclosed bus, along with the use of thermography, in order to determine if age-related degradation is occurring. The program will provide reasonable assurance that the electrical components will perform their intended functions for the period of extended operation.

The Metal-Enclosed Bus Program is a new aging management program that will be implemented prior to the period of extended operation, with the first inspection to be completed prior to the end of the current operating license, and with both the thermography portion and the visual inspection portion to be performed every 10 years thereafter.

The metal-enclosed bus addressed by this program includes the non-segregated bus associated with transformer E-TR-S (the 230-kV startup auxiliary power transformer).

NUREG-1801 Consistency

The Metal-Enclosed Bus Program is a new Columbia program that will be consistent with the 10 elements of an effective aging management program, as described in NUREG-1801, Section XI.E4, “Metal-Enclosed Bus,” with an exception.

Exceptions to NUREG-1801

Program Elements Affected:

- **Parameters Monitored or Inspected**

  The Metal-Enclosed Bus Program will perform the inspection of the various bus joints, seals, and gaskets when the bus assembly covers are removed for inspection of the internal components, rather than the Structures Monitoring Program (as listed in NUREG-1801 item VI.A-12). The Structures Monitoring Program will perform the inspection of the bus assembly external surfaces and the bus assembly structural supports.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program

The Metal-Enclosed Bus Program is credited with detecting aging effects for in-scope metal-enclosed bus. The in-scope bus is limited to non-segregated metal-enclosed bus in the 6.9-kV and 4.16-kV electrical systems associated with the off-site power supply (via transformer E-TR-S).

- Preventive Actions
  The Metal-Enclosed Bus Program is an inspection program; no actions are taken to prevent or mitigate aging degradation.

- Parameters Monitored or Inspected
  The Metal-Enclosed Bus Program will inspect bus insulation for anomalies, such as embrittlement, cracking, melting, swelling, or discoloration, which may indicate overheating or aging degradation. The internal bus enclosure will be inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. The internal bus supports (i.e., internal to the enclosure) will be inspected for structural integrity and any sign of cracks.

  The Metal-Enclosed Bus Program will inspect a sample of bus bolted connections via thermography for signs of loose connections. The in-scope bus will be checked from the exterior with the bus energized to provide gross detection of circuit hot spots.

  The Metal-Enclosed Bus Program will inspect the bus joints, seals, and gaskets when the assembly covers are removed for inspection of the internal components.

- Detection of Aging Effects
  The Metal-Enclosed Bus Program will utilize thermography to check the bolted connections in the non-segregated metal-enclosed bus that is within the license renewal scope. The thermography inspection will be performed for representative portions of the in-scope non-segregated metal-enclosed bus.

  The Metal-Enclosed Bus Program also includes visual inspection of the internal bus enclosure, bus insulation, and internal bus supports. The bus enclosure will be inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. The bus insulation will be inspected for anomalies, such as signs of embrittlement, cracking, melting, swelling, or discoloration, which may indicate overheating or aging degradation. The internal bus supports (internal to the enclosure) will be inspected for structural integrity and signs of cracking. The elastomers used to seal the bus enclosure assembly will be inspected for embrittlement, cracking, loosening, flaking, peeling, and other indications of aging degradation.

  Both the thermography inspection and the visual inspections will be performed at least once every 10 years, with the first inspections to be completed within the 10-year period prior to the end of the current operating license.

The external surfaces of the bus assemblies and the external bus enclosure supports (the structural supports for the entire bus assembly) will be inspected under the Structures Monitoring Program.

- Monitoring and Trending
The Metal-Enclosed Bus Program will not include trending actions. If anomalies are found during the inspection process, they will be addressed at that time through the corrective action program.

- Acceptance Criteria
The acceptance criteria for the thermography portion of the Metal-Enclosed Bus Program will be based on acceptance criteria already used in the thermography process at Columbia. The acceptance criteria for the visual inspection portion (of the bus enclosure) will be that the metal-enclosed bus conductor insulation is free from unacceptable visual indications of surface anomalies, such as embrittlement, cracking, melting, swelling, and discoloration, and that the metal-enclosed bus is also free from unacceptable indications of corrosion, cracking, foreign debris, excessive dust buildup, or evidence of moisture intrusion. In addition, the elastomers used to seal adjacent bus enclosures (exterior) are to be free from indications of aging degradation, such as embrittlement, cracking, loosening, flaking, and peeling. The seal cover gaskets will be inspected when the bus assembly covers are removed for inspection of the internal components. The seal cover gaskets (elastomers) are to be free from indications of aging degradation, such as embrittlement, cracking, loosening, flaking, and peeling.

  The external surfaces of the bus assemblies and the external bus enclosure supports (the structural supports for the entire bus assembly) will be inspected under the Structures Monitoring Program.

- Corrective Actions
This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

  In addition, for the Metal-Enclosed Bus Program, further investigation and evaluation are performed when the acceptance criteria are not met. Corrective actions may include (but are not limited to) cleaning, drying, an increased inspection frequency, replacement, or repair of the affected metal-enclosed bus components. If an unacceptable condition or situation is identified, a determination is made as to whether the same condition or situation is applicable to other accessible or inaccessible metal-enclosed bus.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Metal-Enclosed Bus Program is a new program for which there is no direct site-specific operating experience. Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

  Plant operating experience has shown that the corrective action program has addressed issues related to bus and bus enclosure degradation in recent years. For example, corrosion was identified on insulators used to support bus associated with the unit normal auxiliary transformer (which is not in scope for license renewal). In addition, the corrective action program noted that the use of thermography would provide an improvement to the bus preventive maintenance program. Industry operating experience will be included in the development of this program.

Required Enhancements

Not applicable, this is a new program.

Conclusion

The Metal-Enclosed Bus Program will manage aging degradation for metal-enclosed bus. The Metal-Enclosed Bus Program will provide reasonable assurance that the aging effects will be managed such that metal-enclosed bus subject to aging management review will continue to perform its intended functions consistent with the current licensing basis for the period of extended operation.

B.2.41 Monitoring and Collection Systems Inspection

Program Description

The Monitoring and Collection Systems Inspection is a new one-time inspection that will detect and characterize the conditions on the internal surfaces of subject mechanical components that are exposed to equipment and area drainage water and other potential contaminants and fluids. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, galvanic, general, or pitting corrosion, erosion, or MIC has occurred. The inspection also provides direct evidence as to whether, and to what extent, cracking due to SCC of susceptible materials in susceptible locations has occurred.

Implementation of the Monitoring and Collection Systems Inspection will provide assurance (and confirmation) that the pressure boundary of susceptible safety-related components is maintained consistent with the current licensing basis during the period of extended operation. Implementation of the inspection will also provide assurance (and confirmation) that the structural integrity of susceptible NSR components will be maintained such that spatial interactions (e.g., leakage) will not result in the loss of any safety-related component intended functions during the period of extended operation.

NUREG-1801 Consistency

The Monitoring and Collection Systems Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Monitoring and Collection Systems Inspection includes the internal surfaces of subject mechanical components in the following plant drainage and collection systems that are exposed to potentially radioactive drainage water (untreated water), and in systems with other potential contaminants and fluids during normal plant operations:

  - Equipment Drains Radioactive (EDR) System
  - Floor Drains (FD) System

- Floor Drains Radioactive (FDR) System
- Fuel Pool Cooling (FPC) System
- Miscellaneous Waste Radioactive (MWR) System
- Plant Sanitary Drains (PSD) System
- Process Sampling Radioactive (PSR) System
- Reactor Closed Cooling (RCC) Water System

A representative sample of components in these systems, to be defined in the implementing documents, and to include containment isolation piping and valve bodies, will be examined for evidence of a loss of material (due to crevice, galvanic, general, or pitting corrosion, erosion, or MIC), or to confirm a lack thereof, and the results applied to all of the systems and components within the scope of the inspection, based on engineering evaluation. In addition, the representative sample will include stainless steel components exposed to temperatures greater than 140 ºF that will be examined for evidence of cracking due to SCC.

- Preventive Actions
  No actions are taken as part of the Monitoring and Collection Systems Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Monitoring and Collection Systems Inspection include wall thickness or visual evidence of internal surface degradation, as measures of a loss of material or cracking in susceptible materials. Inspections will be performed by qualified personnel using established NDE techniques.

- Detection of Aging Effects
  The Monitoring and Collection Systems Inspection will use a combination of established volumetric and visual examination techniques (such as equivalent to VT-1 or VT-3) performed by qualified personnel on a sample population of subject components to identify evidence of loss of material or cracking in susceptible materials or to confirm a lack thereof on the susceptible internal surfaces of the components.

  The sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and the lowest design margins. The sample population will include at least one location for containment isolation components.

The Monitoring and Collection Systems Inspection activities will be conducted within the 10-year period prior to the period of extended operation.

- Monitoring and Trending
  This one-time inspection activity is used to characterize conditions and determine if, and to what extent, further actions may be required. The activity includes provisions for increasing the inspection sample size and location if degradation is detected.

  The sample size will be determined by engineering evaluation of the materials of construction, environment (i.e., service conditions), aging effects, and operating experience (e.g., time in-service, most susceptible locations, lowest design margins). Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action process to determine the need for subsequent aging management activities and for monitoring and trending of the results.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Monitoring and Collections Systems Inspection is a new one-time inspection activity for which plant operating experience has not shown the need to manage the aforementioned aging effects for the in-scope systems. The inspection provides for confirmation of material conditions near the period of extended operation. The elements comprising the inspection activity are to be consistent with industry practice.

NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

A review of Columbia operating experience to date identified an occurrence of loss of material due to corrosion within the FDR System in 2003. The susceptible FDR piping and valves were subsequently re-designed to eliminate standing water and replaced with a corrosion resistant, stainless steel, material in 2005. No additional instances of corrosion have occurred in the FDR System since the implementation of the modification.

The site corrective action program, and an ongoing review of industry operating experience, will be used to ensure that the identified aging effects do not require management for the systems within the scope of this activity.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Monitoring and Collection Systems Inspection will verify that there are no aging effects requiring management for the subject components, or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation, and that spatial interactions (e.g., leakage) will not result in loss of safety-related component intended functions during the period of extended operation.

B.2.42 Open-Cycle Cooling Water Program

Program Description

The Open-Cycle Cooling Water Program manages loss of material due to crevice, galvanic, general, pitting, and MIC, and erosion for components located in the Standby Service Water and Plant Service Water systems, and components connected to or serviced by those systems, and in the Tower Makeup Water and Circulating Water systems. The program also manages fouling due to particulates (e.g., corrosion products) and biological material (micro- and macro-organisms) resulting in reduction in heat transfer for heat exchangers within the scope of the program. In addition, the program manages cracking for copper alloy > 15% Zn components in the Process Sampling System and for aluminum components in the HVAC systems that are subject to condensation.

The Open-Cycle Cooling Water Program consists of inspections, surveillances, and testing to detect the presence, and assess the extent, of fouling, loss of material, and cracking, combined with chemical treatments and cleaning activities to minimize fouling, loss of material, and cracking. The existing program is a combination condition monitoring and mitigation program that implements the recommendations of NRC GL 89-13, “Service Water System Problems Affecting Safety-Related Equipment.”

NUREG-1801 Consistency

The Open-Cycle Cooling Water Program is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801 Section XI.M20, “Open-Cycle Cooling Water System,” with exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Preventive Actions –**

  NUREG-1801 states that system components are lined or coated to protect underlying metal surfaces from being exposed to aggressive cooling water environments. Protective coatings on the inner walls are not used in the service water systems that are within the scope of license renewal at Columbia.

- **Monitoring and Trending –**

  NUREG-1801 states that testing and inspections are performed annually and during refueling outages. Inspection frequencies for the Open-Cycle Cooling Water Program are based on operating conditions and past history; flow rates, water quality, lay-up, and heat exchanger design.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Scope –**

  Address loss of material due to cavitation erosion (for the Standby Service Water (SW), Circulating Water (CW), Plant Service Water (TSW), and Tower Make-Up (TMU) systems) with activities such as opportunistic inspections of portions of the systems that have had indications of cavitation erosion in the past.

- **Scope –**

  Include the NSR components within the license renewal scope in the SW, CW, TSW, and TMU systems, and the NSR components served by or connected to the TSW System that are in the following plant systems:

  - Process Sampling (PS) System
  - Process Sampling Radioactive (PSR) System
  - Radwaste Building Mixed Air (WMA) System
  - Radwaste Building Return Air (WRA) System
  - Reactor Building Return Air (RRA) System
  - Reactor Closed Cooling Water (RRC) System

Operating Experience

The Open-Cycle Cooling Water Program is an ongoing program that has implemented the recommended actions of NRC GL 89-13 and has justified any alternatives to those recommendations. The health of the program and corresponding systems are periodically reported, including chemistry trends and material conditions. Industry operating experience is evaluated for impact to Columbia, and periodic self assessments are conducted. As a result, Columbia has programs in place with operating experience to demonstrate that the effects of aging on the service water systems, and on the safety-related heat exchangers that they serve, as well as on the plant service water systems and NSR heat exchangers they serve, will be effectively managed during the period of extended operation.

In addition, annual ultimate heat sink and spray pond performance, as well as related GL 89-13 systems, components, and controls, is a subject of NRC integrated inspection. In recent years, reviews were performed by NRC inspectors to verify the acceptability of test methods and conditions, acceptance criteria, use of instrument uncertainties, frequency of testing, biofouling controls, compliance with design parameters, and the extrapolation of test data to design conditions. No findings of significance with respect to the effectiveness of the existing program were identified during these integrated inspections.

Furthermore, a review of plant-specific operating experience has identified several instances of damage due to erosion, designated as cavitation erosion. There have been repeated instances of leaks and failures in the SW System, which were cavitation-related. The design and operational adjustments have not fully precluded subsequent cavitation-related failures. That is, design and operational adjustments have corrected the issues sufficient to support continued operation of the plant, but have not fully eliminated the occurrence of cavitation erosion in the service water or attached systems. Therefore, in the course of normal operation during the period of extended operation, it is plausible that cavitation erosion could have the same effect as other forms of erosion (e.g., particulate) in the raw water environment of the service water and attached systems.

Conclusion

The Open-Cycle Cooling Water Program will detect and manage loss of material and reduction in heat transfer for susceptible components in raw water environments. The Open-Cycle Cooling Water Program, with the required enhancements, provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.43 Potable Water Monitoring Program

Program Description

The Potable Water Monitoring Program mitigates damage due to loss of material due to corrosion and erosion for components that contain potable water and are within the scope of license renewal to ensure that the integrity of piping and components is maintained. The Potable Water Monitoring Program is an existing mitigation program that is comprised of water treatment activities, including flocculation, sedimentation, filtration, and chemical addition.

Prior to the period of extended operation, the Potable Water Monitoring Program will be enhanced to include periodic inspection activities to provide additional confirmation that the integrity of piping and components will be maintained for the period of extended operation. As such, the Potable Water Monitoring Program will be a combination mitigation and condition monitoring program. At least one inspection will be conducted within the 10-year period prior to the period of extended operation.

NUREG-1801 Consistency

The Potable Water Monitoring Program is an existing Columbia program, with required enhancements, that is plant-specific. There is no corresponding aging management program described in NUREG-1801.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Potable Water Monitoring Program is credited for managing loss of material for aluminum, copper alloy, copper alloy > 15% Zn, gray cast iron, and steel components that are exposed to potable water in the following systems:

    - Reactor Building Outside Air (ROA) System
    - Potable Cold Water (PWC) System
    - Potable Hot Water (PWH) System

- Preventive Actions
  The Potable Water Monitoring Program is an existing mitigation program comprised of water treatment activities, including flocculation, sedimentation, filtration, and chemical addition.

- Parameters Monitored or Inspected
  The Potable Water Monitoring Program monitors the water treatment plant performance and the overall status of the potable water system, including water quality.

- Detection of Aging Effects
  The Potable Water Monitoring Program will be enhanced to use a combination of established volumetric and visual examination techniques performed by qualified personnel on locations within the PWC, PWH, and ROA systems, as determined by engineering evaluation, to identify evidence of a loss of material, or to confirm a lack thereof. At least one inspection will be conducted within the 10-year period prior to the period of extended operation.

  Based on operating experience, it is necessary that inspections be conducted at least once every five years, and include components of the PWC and PWH systems that are located in the Reactor Building, and components associated with the ROA air washer (ROA-AW-1), including the air washer housing.

- Monitoring and Trending
  The Potable Water Monitoring Program monitors the water treatment plant performance and the overall status of the potable water system, including water quality, and the results are recorded and trended.

- Acceptance Criteria
  The acceptance criteria for potable water system inspections are: indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.

  Acceptance criteria have been established for potable water quality, which minimizes the presence of impurities that could cause degradation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  As revealed by the operating experience review, corrosion and subsequent system leakage has been a recurring problem in the Columbia potable water systems. These problems have been detected, and components have been isolated and repaired or replaced in a timely manner, in accordance with the corrective action program. None of the system leakage problems have occurred in portions of the systems that are within the Reactor Building where they could affect safety-related equipment due to leakage or spray. The majority of the leaks have been in the yard loop piping which is external to the power block structures and is buried. This piping is PVC material which makes it susceptible to leaks due to changes in temperature related to location and environment. The piping in the Reactor Building is not exposed to the same environment (i.e., indoor air not soil) and is not of the same material (i.e., is metallic not PVC).

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Detection of Aging Effects –**

  Include periodic inspection activities. Based on operating experience, it is necessary that inspections be conducted at least once every five years, and include components of the PWC and PWH systems that are located in the Reactor Building, and components associated with the ROA air washer (ROA-AW-1), including the air washer housing.

Conclusion

The Potable Water Monitoring Program, supplemented by at least one inspection prior to entering the period of extended operation, and with the required enhancements, provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.44 Preventive Maintenance – RCIC Turbine Casing

Program Description

The Preventive Maintenance – RCIC Turbine Casing manages loss of material due to general corrosion on the internal surfaces of the Reactor Core Isolation Cooling (RCIC) pump turbine casing and associated piping and piping components downstream from the steam admission valve. Preventive Maintenance – RCIC Turbine Casing is a condition monitoring activity comprised of periodic inspection and surveillance activities to detect aging and age-related degradation.

NUREG-1801 Consistency

Preventive Maintenance – RCIC Turbine Casing is an existing Columbia program that is plant-specific. There is no corresponding aging management program described in NUREG-1801.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  Preventive Maintenance – RCIC Turbine Casing is credited for managing loss of material due to general corrosion on the internal steel surfaces in the RCIC pump turbine casing and the in-scope piping and piping components in steam lines downstream from the steam admission valve. These components are exposed to steam during RCIC system operation and testing and to an ambient air internal environment during normal plant operation. The ambient (untreated, moist) air internal environment is a result of steam having either condensed and drained to the barometric condenser or vented to the suppression chamber (drywell). Inspections are focused on the casing with the results applying to the other associated components because of the similarities in materials and environment. For example, if inspection results indicate an absence of general corrosion on the turbine casing, then general corrosion would not be expected on any of the other susceptible components.

- Preventive Actions
  Preventive Maintenance – RCIC Turbine Casing does not include any actions to prevent or mitigate the effects of aging.

- Parameters Monitored or Inspected
  Preventive Maintenance – RCIC Turbine Casing inspects the internal steel surfaces of the RCIC pump turbine casing for signs of degradation (leakage, pitting, corrosion, etc.) that might be indicative of loss of material.

- Detection of Aging Effects
In accordance with the information provided in the *Monitoring and Trending* element, Preventive Maintenance – RCIC Turbine Casing detects loss of material prior to any loss of component intended function.

- Monitoring and Trending
Preventive Maintenance – RCIC Turbine Casing is a condition monitoring activity that is performed by qualified individuals at established intervals to identify internal degradation of the turbine casing through visual inspection. If unacceptable deterioration is noted during the internal inspection of the turbine casing, the inspection results will be evaluated through the corrective action program.

- Acceptance Criteria
The acceptance criteria for Preventive Maintenance – RCIC Turbine Casing are no unacceptable visual indications of loss of material. Unacceptable indications are those that are determined by engineering evaluation to degrade the components to such an extent that they may not be capable of performing their intended function (pressure boundary integrity) until the next scheduled inspection.

- Corrective Actions
This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
The elements that comprise Preventive Maintenance – RCIC Turbine Casing are consistent with industry practice and have proven effective in maintaining the material condition of the RCIC pump turbine, including the casings.

  A review of the most recent work order documentation for the turbine internal inspections reveals that RCIC turbine casing inspections are performed in accordance with procedure, results are documented and retrievable, and that, if degradation is indicated, corrective actions are taken. A review of the most recent plant-specific operating experience, through a search of condition reports, revealed that no loss of pressure boundary integrity has occurred that was, or could have been, attributed to the aging effects that are in the scope of the program. Some minor leakage was identified that was corrected and the material condition was monitored, as indicated in the system health reports for 2007, to ensure that no further degradation or loss of function occurred. Other issues in the system health reports for 2008 involve valve seat and packing leakage, which are issues that are not within the scope of license renewal.

Required Enhancements

None.

Conclusion

Preventive Maintenance – RCIC Turbine Casing will detect and manage loss of material. The continued implementation of Preventive Maintenance – RCIC Turbine Casing provides reasonable assurance that the effects of aging will be managed such that components subject to aging management will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.45 Reactor Head Closure Studs Program

Program Description

The Reactor Head Closure Studs Program manages cracking due to SCC and loss of material due to corrosion for the reactor head closure stud assemblies (studs, nuts, washers, and bushings.)

The Reactor Head Closure Studs Program examines reactor vessel stud assemblies in accordance with the examination and inspection requirements specified in Table IWB-2500-1. The program includes visual and volumetric examinations in accordance with the general requirements of Subsection IWA-2000. Inspections include VT-1 visual examination of the nuts, washers, and bushing and volumetric examination of studs and threads. VT-2 inspections for leak detection are performed during system pressure tests. The inspection of the reactor vessel closure studs, performed in accordance with ASME Code, Section XI, Subsection IWB, Table IWB 2500-1 (2003 addenda), includes volumetric examinations rather than the surface examinations called out in paragraph NB-2545 or NB-2546 of Section III of the ASME Code.

The ultimate tensile stress for the Columbia studs and nuts (SA-540 Grade B23 or B24) is less than the 170 ksi limitation in Regulatory Guide 1.65 and are therefore bounded by the NUREG-1801 program. There are no metal platings applied to the Columbia closure studs, nuts, or washers. A phosphate coating is applied to threaded areas of studs and nuts and bearing areas of nuts and washers to act as a rust inhibitor and to assist in retaining lubricant on these surfaces.

The Reactor Head Closure Studs Program includes the preventive measures of RG 1.65 to mitigate cracking, including the use of a stable lubricant.

The Reactor Head Closure Studs Program credits portions of the Inservice Inspection (ISI) Program.

NUREG-1801 Consistency

The Reactor Head Closure Studs Program is an existing Columbia program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M3, “Reactor Head Closure Studs.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

Industry operating experience:

NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

Stress corrosion cracking has occurred in other BWR reactor head closure studs as described in a GE service information letter.

The Reactor Head Closure Studs Program detects aging effects using nondestructive examination (NDE) visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. A review of operating experience in recently submitted License Renewal Applications includes the following.

- Surface examination of RPV studs and nuts in 2001 at Cooper Nuclear Station during RE20 identified a recordable indication for RPV nuts, two non-recordable indications for RPV studs and a non-recordable for RPV washers. The recordable indication was evaluated as satisfactory.
- Duane Arnold Energy Center has had no recordable indications reported for the RPV stud and nut inspections as required by the ASME Section XI.
- Crystal River reports no cracking or loss of material for the Unit 3 Closure Head Stud Assembly. There have been no aging effects identified that have been attributed to wear, loss of material or stress-corrosion cracking.
- Palo Verde reported no cracking due to SCC or IGSCC for PVNGS reactor vessel studs, nuts, flange stud holes, or washers.

Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program. As such, operating experience assures that implementation of the Reactor Head Closure Studs Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Columbia operating experience:

Review of Columbia operating experience (condition reports, work orders, etc.) has not revealed any reactor head closure stud cracking or loss of material. The existing program is adequately managing the aging of the reactor head closure studs to maintain the intended function, and will continue to do so for the period of extended operation.

The Reactor Head Closure Studs Program has been developed based on relevant plant and industry operating experience. The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the new program is effective in managing the identified aging effects.

Conclusion

The Reactor Head Closure Studs Program manages cracking and loss of material for the reactor head closure stud assemblies. The Reactor Head Closure Studs Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.46 Reactor Vessel Surveillance Program

Program Description

The Reactor Vessel Surveillance Program manages the reduction of fracture toughness due to radiation embrittlement for the low alloy steel reactor vessel shell and welds in the beltline region. The Reactor Vessel Surveillance Program is a condition monitoring program developed in response to 10 CFR 50 Appendix H.

The Columbia program is part of the BWRVIP Integrated Surveillance Program (ISP) that includes multiple BWR vessels. The BWRVIP ISP is an NRC-approved program that appropriately implements the requirements of Appendix H to 10 CFR Part 50. Testing and reporting done by the BWRVIP ISP is performed in accordance with the requirements of ASTM E 185 (1982). The NRC has approved the use of the BWRVIP ISP in place of a unique plant program for Columbia. The BWRVIP ISP has been revised for License Renewal, as documented in BWRVIP-116, to ensure representative capsules are irradiated to fluence levels corresponding to the end of the period of extended operation.

The BWRVIP ISP uses material surveillance capsules in BWR plants, as well as supplemental capsules irradiated in host plants, to provide data which bounds all operating BWR plants. No surveillance capsules from Columbia are included in the BWRVIP ISP; however, the Columbia surveillance capsules will continue to be maintained in the reactor vessel in standby (deferred) status as required by the ISP. Capsules from host plants will be removed and tested in accordance with the ISP implementation plan defined in BWRVIP-86-A. Results from these tests that are applicable to Columbia will provide the necessary data to monitor embrittlement for the Columbia reactor pressure vessel (RPV). EN will apply the results of the ISP capsule testing to Columbia.

The neutron fluence values used for the projections of neutron embrittlement effects are determined using NRC-approved methodology. The exposure conditions of the reactor vessel are monitored to ensure that they continue to be consistent with those used to project the effects of embrittlement to the end of the license term. If the reactor vessel exposure conditions (neutron flux, spectrum, irradiation temperature, etc.) are altered, then the basis for the projection to 60 years is reviewed; and, if deemed appropriate, a revised fluence projection is prepared and the effects of the revised fluence analysis on neutron embrittlement calculations will be evaluated.

The determination of neutron embrittlement effects for Columbia fully complies with NRC Regulatory Guide 1.99, Revision 2. Projections for neutron embrittlement effects have been adjusted to account for the specific nickel and copper contents of the Columbia materials. The extent of reactor vessel embrittlement for upper-shelf energy (USE) and adjusted reference temperature for nil-ductility transition (ART) is projected for 60 years in accordance with Regulatory Guide 1.99, Revision 2. These projections will be updated throughout the remaining life of Columbia if new information (e.g., material data from the ISP applicable to Columbia, or revised fluence values) becomes available. P-T limits will be managed for the period of extended operation. Participation in the BWRVIP ISP will ensure that changes to irradiation embrittlement information will be factored into the determination of any required operating restrictions in a timely fashion.

The Columbia program requires that untested capsules either be returned to the reactor vessel or maintained in storage for possible future re-insertion. As no Columbia capsules are scheduled for testing, the disposition of tested capsules is not applicable to Columbia.

The Columbia Reactor Vessel Surveillance Program will also monitor the Effective Full Power Years (EFPY) accumulated by the unit and ensure that the P-T limit curves contained in plant technical specifications are updated periodically such that they are always valid beyond the EFPY that the plant has accumulated. Reactor vessel P-T limits will thus be managed as a TLAA for the period of extended operation.

NUREG-1801 Consistency

The Reactor Vessel Surveillance Program is an existing Columbia program that is consistent with the 10 elements of an effective integrated surveillance program as described in NUREG-1801, Section XI.M31, "Reactor Vessel Surveillance."

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

The Reactor Vessel Surveillance Program has been effective in managing reduction of fracture toughness for the reactor vessel beltline components.

Industry operating experience:

> Columbia participates in the BWRVIP ISP as described in reports BWRVIP-86-A and BWRVIP-116. Participation in the ISP ensures that future operating experience from all participating BWRs will be factored into the Reactor Vessel Surveillance Program. The NRC has concurred that the Reactor Vessel Surveillance Program is an acceptable program based on the NRC safety evaluation reports (SERs) for the

BWRVIP ISP and the SER for the replacement of the Columbia site-specific program with the ISP.

Columbia operating experience:

A review of Columbia operating experience identified no issues related to reactor vessel embrittlement. Surveillance specimen analysis and embrittlement projections are being performed by the BWRVIP ISP.

The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the new program is effective in managing the identified aging effects.

Conclusion

The Reactor Vessel Surveillance Program manages reduction of fracture toughness for components of the reactor vessel beltline region. The Reactor Vessel Surveillance Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.47 Selective Leaching Inspection

Program Description

The Selective Leaching Inspection will detect and characterize the conditions on internal and external surfaces of subject components that are exposed to raw water, treated water (including closed cycle cooling water and steam), fuel oil, soil (buried), and moist air (including condensation) environments. This one-time inspection provides direct evidence through a combination of visual examination and material hardness testing, or NRC approved alternative, of whether, and to what extent, a loss of material due to selective leaching has occurred or is likely to occur that could result in a loss of intended function.

Implementation of the Selective Leaching Inspection prior to the period of extended operation will ensure that the pressure boundary integrity of susceptible components is maintained consistent with the current licensing basis during the period of extended operation. Implementation of the inspection will also provide added assurance that the structural integrity of susceptible components is maintained such that spatial interaction will not impair or prevent a safety-related intended function during the period of extended operation.

NUREG-1801 Consistency

The Selective Leaching Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M33, “Selective Leaching of Materials.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Selective Leaching Inspection is credited for evaluating the condition of selective leaching susceptible components and assessing their ability to perform their intended function during the period of extended operation. Susceptible components include piping and tubing, valve bodies, pump casings, filter bodies, heat exchanger components, hydrants, strainers, tanks, and trap bodies. Components within the scope of the program are formed of gray cast iron or copper alloy > 15% Zn. The components are exposed to raw water, treated water (including closed cycle cooling water and steam), fuel oil, soil (buried), or moist air (including condensation) environments during normal plant operations. The one-time

inspection includes a visual examination and hardness measurement, or NRC approved alternative, of a sample set of components to determine whether selective leaching is occurring or is likely to occur in the period of extended operation.

The aging management activity is credited for the following systems:

- Auxiliary Steam (AS) System
- Circulating Water (CW) System
- Containment Nitrogen (CN) System
- Control Rod Drive (CRD) System
- Diesel Building HVAC Systems (DMA)
- Diesel Fuel Oil (DO) System
- Fire Protection (FP) System
- High Pressure Core Spray (HPCS) System
- Low Pressure Core Spray (LPCS) System
- Main Steam (MS) System
- Plant Service Water (TSW) System
- Potable Cold Water (PWC) System
- Potable Hot Water (PWH) System
- Process Sampling (PS) System
- Radwaste Building Chilled Water (WCH) System
- Radwaste Building HVAC Systems (WEA, WMA, WOA, WRA)
- Reactor Building HVAC Systems (REA, ROA, RRA)
- Residual Heat Removal (RHR) System
- Standby Service Water (SW) System
- Tower Makeup Water (TMU) System

- Preventive Actions
  No actions are taken as part of the Selective Leaching Inspection to prevent aging effects or to mitigate aging degradation. Although the control of water chemistry may reduce selective leaching in treated water environments, no specific credit is taken for water chemistry control as part of this program.

- Parameters Monitored or Inspected
  The Selective Leaching Inspection will perform a combination of visual examination and hardness testing, or NRC approved alternative, of components within the scope of the program as a measure of loss of material due to selective leaching.

  The Selective Leaching Inspection activities will be conducted after the issuance of the renewed operating license and prior to the end of the current operating license, with sufficient time to implement programmatic oversight prior to the period of extended operation. The activities will be conducted no earlier than 5 years prior to the end of the current operating license, so that conditions are more representative of the conditions expected during the period of extended operation.

- Detection of Aging Effects
  The Selective Leaching Inspection will include provision for a combination of visual examination and hardness testing, or NRC approved alternative, of a sample of components with susceptible materials in environments conducive to the occurrence of selective leaching. The program will include the criteria for visual inspection and for hardness testing. The results of the inspections will be evaluated to determine the condition of the material. Engineering evaluation in conjunction with the corrective action program will determine whether components with degraded materials are capable of performing their intended functions.

  The aging management activities include: (a) determination of the sample size based on an assessment of materials of fabrication, environment and conditions, and operating experience; (b) identification of the inspection locations in the susceptible system or component; (c) determination of the examination technique, including acceptance criteria; and (d) evaluation of the need for follow-up examinations to monitor the progression of aging if age-related degradation is found that could jeopardize an intended function before the end of the period of extended operation.

  The results of the inspections will be evaluated against the acceptance criteria. Additional testing will be performed, as necessary, based on review of the inspection results.

- Monitoring and Trending
  No actions are taken as part of the Selective Leaching Inspection to monitor or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions, including monitoring and trending, may be required. The inspection results will be evaluated through the site corrective action process.

- Acceptance Criteria
  The Selective Leaching Inspection will include acceptance criteria for visual inspections and for hardness testing, or NRC approved alternative. Inspection

results that do not meet the acceptance criteria will be entered into the corrective action program. The corrective action program includes provision for further evaluation of degraded materials and any necessary corrective actions.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Selective Leaching Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effect. However, plant design considerations address the potential for degradation of installed components through the application of materials suitable for the expected operating environments, and inspection methods will be consistent with accepted industry practices.

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  Energy Northwest will follow the industry initiatives with respect to inspection for selective leaching, such as those being pursued by the EPRI and the NEI License Renewal Implementation Working Group. If a suitable alternative to hardness testing is identified prior to implementation of the inspection, Energy Northwest will seek NRC approval prior to its use.

  Some evidence of dezincification of the brass tubes in the main condenser was identified through visual inspection prior to startup (1982), and attributed to stagnant circulating water and a drop in pH. The condenser tubes, which are not in the scope of license renewal, were cleaned and there has been no recurrence of dezincification, although there are still residual effects of the original dezincification.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Selective Leaching Inspection will verify that selective leaching does not require management for the susceptible components, or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.48 Service Air System Inspection

Program Description

The Service Air System Inspection is a new one-time inspection that will detect and characterize the material condition of piping and valve bodies that are within the scope of license renewal in the Service Air System and are exposed to an “Air (internal)” environment. The Service Air System Inspection provides direct evidence as to whether, and to what extent, a loss of material due to general corrosion has occurred or is likely to occur in the subject components that could result in a loss of intended function.

Implementation of the Service Air System Inspection will ensure that the pressure boundary integrity of the subject components will be maintained consistent with the current licensing basis during the period of extended operation. Implementation of the inspection will also provide assurance (and confirmation) that the structural integrity of susceptible NSR components will be maintained such that the integrity of the attached safety-related piping is not impacted and will not result in the loss of any safety-related component intended functions during the period of extended operation.

NUREG-1801 Consistency

The Service Air System Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Service Air System Inspection detects and characterizes conditions relative to the following subject mechanical components to determine whether, and to what extent, degradation is occurring:

    - Loss of material due to general corrosion on steel piping and valve bodies exposed to an air (internal) environment.

  The Service Air System Inspection focuses on the portion of the Service Air System that forms the pressure boundary for containment penetration X93 and the connected piping subject to an air (internal) environment (i.e., compressed air) that performs a structural integrity function. The Service Air System Inspection provides symptomatic evidence of loss of material (due to general corrosion).

- Preventive Actions
  No actions are taken as part of the Service Air System Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Service Air System Inspection include wall thickness or visual evidence of internal surface degradation, as measures of loss of material. Inspections will be performed by qualified personnel using established NDE techniques.

- Detection of Aging Effects
  The Service Air System Inspection will use a combination of established volumetric (radiographic or ultrasonic testing) and visual (VT-3 or equivalent) examination techniques performed by qualified personnel on a portion of the subject Service Air System components as determined by engineering evaluation, to identify evidence of a loss of material, or to confirm a lack thereof.

  The sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and design margins.

  The Service Air System Inspection will be conducted within the 10-year period prior to the period of extended operation.

- Monitoring and Trending
  This one-time inspection activity is used to characterize conditions and determine if, and to what extent, further actions may be required. The activity includes increasing the inspection sample size and location if degradation is detected.

  Sample size will be determined by engineering evaluation of the materials of construction, environment (i.e., service conditions), aging effects, and operating experience (e.g., time in-service, most susceptible locations, lowest design margins). Inspection findings that do not meet the acceptance criteria will be evaluated using the corrective action process to determine the need for subsequent aging management activities and for monitoring and trending of the results.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective

action program to determine whether they could result in a loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Service Air System Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effect. The activity provides confirmation of conditions where degradation is not expected, has not evidenced as a problem, or where the aging mechanism is slow acting. Due to the fact that portable compressors without dryers have been used in the Service Air System, the system may not have always been reliably dry. This inspection will verify the presence (or absence) of general corrosion within the license renewal boundary of the Service Air System.

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  A review of Columbia operating experience to date has identified no instances of loss of material related to the subject components.

  The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program is effective in managing the identified aging effects.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Service Air System Inspection will verify that there are no aging effects requiring management for the subject components or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.49 Small Bore Class 1 Piping Inspection

Program Description

The Small Bore Class 1 Piping Inspection will detect and characterize the conditions on the internal surfaces of small bore Class 1 piping components that are exposed to reactor coolant. The one-time inspection will provide physical evidence as to whether, and to what extent, cracking due to SCC or to thermal or mechanical loading has occurred in small bore Class 1 piping components. It will also verify, by inspections for cracking, that reduction of fracture toughness due to thermal embrittlement requires no additional aging management for small Class 1 CASS valve bodies. The Small Bore Class 1 Piping Inspection will be an evaluation and inspection with no actions to prevent or mitigate aging effects.

This one-time inspection is applicable to small bore ASME Code Class 1 piping components less than 4 inches nominal pipe size (NPS 4), which includes piping, fittings, branch connections, and valve bodies. The Small Bore Class 1 Piping Inspection includes visual and volumetric inspection of a representative sample of small bore Class 1 piping components. The inspection provides additional assurance that either age-related degradation of small bore ASME Code Class 1 piping components is not occurring or that the aging is insignificant, such that an additional aging management program is not warranted during the period of extended operation.

Columbia has not experienced cracking of small bore Class 1 piping solely due to stress corrosion or thermal and mechanical loading, and therefore this one-time inspection is appropriate.

The inspection will include a representative sample of the small bore Class 1 piping population, and, where practical, will focus on the bounding or lead components most susceptible to aging due to time in service, severity of operating conditions, and lowest design margin. The guidelines of EPRI Report 1000701, "Interim Thermal Fatigue Management Guideline (MRP-24)" will be considered in selecting the sample size and locations. Actual inspection locations will be based on physical accessibility, exposure levels, NDE techniques, and locations identified in NRC Information Notice (IN) 97-46. Volumetric examinations (including qualified destructive and/or nondestructive techniques) will be performed by qualified personnel following procedures that are consistent with Section XI of the ASME Code and 10 CFR 50, Appendix B.

Unacceptable inspection findings will be evaluated by the Columbia corrective action process using criteria in accordance with the ASME Code. The evaluation of indications will include determining the extent of condition by the expansion of the sample size when called for by the Code. Evaluation of inspection results may lead to the creation of a plant-specific AMP or may confirm that age-related degradation is either not occurring or is insignificant.

The Small Bore Class 1 Piping Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted during the portion of the fourth 10-year ISI interval that is prior to the period of extended operation.

The Small Bore Class 1 Piping Inspection will credit portions of the Inservice Inspection (ISI) Program. The Small Bore Class 1 Piping Inspection will verify the effectiveness of the BWR Water Chemistry Program in mitigating cracking of small bore piping and piping components.

NUREG-1801 Consistency

The Small Bore Class 1 Piping Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M35, "One-time Inspection of ASME Code Class 1 Small-Bore Piping."

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Small Bore Class 1 Piping Inspection is a one-time inspection of a sample of ASME Code Class 1 piping and piping components less than NPS 4. The inspection will include measures to verify that unacceptable degradation is not occurring in Class 1 small bore piping and piping components (valve bodies), thereby confirming that an aging management program is not needed for the period of extended operation. See *Monitoring and Trending* below for a discussion of sample selection and inputs.

- Preventive Actions
  The Small Bore Class 1 Piping Inspection will be an evaluation and inspection with no actions to prevent or mitigate aging effects.

- Parameters Monitored or Inspected
  The Small Bore Class 1 Piping Inspection is a one-time inspection that will include volumetric examinations (destructive or nondestructive) performed by qualified personnel, using qualified volumetric examination techniques, and following procedures consistent with Section XI of the ASME Code and 10 CFR 50, Appendix B.

- Detection of Aging Effects
  This inspection will perform volumetric examinations on selected weld locations. Columbia has not experienced cracking of small bore Class 1 piping due to stress corrosion or thermal and mechanical loading, and therefore this one-time inspection is appropriate. Columbia has found cracking due to fatigue and growth of construction flaws of small bore piping. See *Operating Experience* below for discussion of site operating experience to date and lack of stress corrosion or thermal and mechanical loading induced cracks.

- Monitoring and Trending
  The inspection will include a representative sample of the small bore Class 1 piping population, and, where practical, will focus on the bounding or lead components most susceptible to aging due to time in service, severity of operating conditions, and lowest design margin. The guidelines of EPRI Report 1000701, "Interim Thermal Fatigue Management Guideline (MRP-24)" will be considered in selecting the sample size and locations. Actual inspection locations will be based on physical accessibility, exposure levels, NDE techniques, and locations identified in NRC Information Notice 97-46. Volumetric examinations (including qualified destructive and nondestructive techniques) will be performed by qualified personnel following procedures that are consistent with Section XI of the ASME Code and 10 CFR 50, Appendix B.

  Unacceptable inspection findings will be evaluated by the Columbia corrective action process. The Small Bore Class 1 Piping Inspection will require an increased sample size in response to unacceptable inspection findings. Evaluation of inspection results may lead to the creation of a plant-specific aging management program or may confirm that age-related degradation is either not occurring or is insignificant.

- Acceptance Criteria
  Unacceptable inspection findings will be evaluated by the Columbia corrective action process using criteria in accordance with the ASME Code. The evaluation of indications will include determining the extent of condition by the expansion of the sample size when called for by the Code. Evaluation of inspection results may lead to the creation of a plant-specific aging management program or may confirm that age-related degradation is either not occurring or is insignificant.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation. The Small Bore Class 1 Piping Inspection provides confirmation of material conditions near the period of extended operation as additional assurance that existing inspections, via the Inservice Inspection (ISI) Program, and control of water chemistry, via the BWR Water Chemistry Program, provide adequate management.

  Industry operating experience:

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  Industry operating experience will be considered when implementing this one-time inspection. Plant operating experience for this activity will be gained as it is implemented near the period of extended operation, and will be factored into the activity. As such, operating experience assures that implementation of the Small Bore Class 1 Piping Inspection will confirm material condition relative to the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

  Columbia operating experience:

  A review of Columbia operating experience identified other piping being examined by the same techniques and small bore piping that has experienced cracking due to fatigue.

  The Small Bore Class 1 Piping Inspection is a new one-time inspection activity for which plant operating experience has shown only one occurrence of stress corrosion cracking, and that as one of several contributors to fatigue cracking. The evaluations and examinations to be performed by this activity will use qualified volumetric examination techniques or destructive examination techniques with demonstrated capability and a proven industry record to detect cracking in piping weld and base metal.

Several cracks due to vibration induced fatigue or construction flaws occurred in small bore piping during the early years of plant life. Design changes were instituted to reduce vibration and sources of cyclic loading. The occurrence of these small bore leaks has decreased in recent years showing the effectiveness of the actions being taken. No instances of stress corrosion cracking or low cycle fatigue cracking as the sole failure mechanism were identified. A single instance of small bore Class 1 piping failure related to stress corrosion cracking was found in 1993, which also involved other contributing factors that led to fatigue cracking. The weld was removed and configuration was changed to address the vibration and cyclic loading considerations. No other instances of stress corrosion cracking of small bore Class 1 piping have been identified.

The Small Bore Class 1 Piping Inspection will be developed based on relevant plant and industry operating experience. The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the one-time inspection confirms material condition such that the existing program (ISI) is demonstrated to be effective in managing the identified aging effects, or a new aging management program will be developed.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

The Small Bore Class 1 Piping Inspection will verify that cracking due to stress corrosion and mechanical loading, and cracking due to reduction of fracture toughness are not occurring or are insignificant, such that an aging management program is not required during the period of extended operation. The Small Bore Class 1 Piping Inspection will provide reasonable assurance that the aging effects are not occurring such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.50 Structures Monitoring Program

Program Description

The Structures Monitoring Program is part of the Maintenance Rule program. It is an existing program that is designed to ensure that age-related degradation of the plant structures and structural components within its scope is managed to ensure that each structure and structural component retains the ability to perform its intended function. The Maintenance Rule program is comprised of many existing monitoring and assessment activities, which collectively address potential and actual degradation conditions and their effects upon the reliability of the structures and components that are within the scope of the program.

The Structures Monitoring Program implements provisions of the Maintenance Rule, 10 CFR 50.65, which relate to structures, masonry walls, and water-control structures. It conforms to the guidance contained in Regulatory Guide (RG) 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants", and NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." Concrete and masonry walls that perform a fire barrier intended function are also managed by the Fire Protection Program.

The Structures Monitoring Program encompasses and implements the Water Control Structures Inspection and the Masonry Wall Inspection.

Since protective coatings are not relied upon to manage the effects of aging for structural components included in the Structures Monitoring Program, the program does not address protective coating monitoring and maintenance.

Aging effects identified within the scope of the Structures Monitoring Program are detected by visual inspection of external surfaces prior to the loss of the structure's or component's intended functions.

The Structures Monitoring Program provides reasonable assurance that the effects of aging are adequately managed to assure that plant structures and structural components' intended function will be performed consistent with the current licensing basis for the period of extended operation.

NUREG-1801 Consistency

The Structures Monitoring Program is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S6, "Structures Monitoring Program."

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Scope –**

  Include and list the following structures within the scope of license renewal that credit the Structures Monitoring Program for aging management:

  - Circulating Water Basin
  - Circulating Water Pump House
  - Condensate Storage Tanks Foundations and Retaining Area
  - Cooling Tower Basins
  - Diesel Generator Building
  - Duct Banks and Manholes
  - Fire Water Bladder Tank (FP-TK-110) Embankment
  - Fresh Air Intake Structure No. 1 and 2
  - Hydrogen Storage and Supply Facility
  - Makeup Water Pump House
  - Primary Containment (includes drywell, biological shield wall, reactor pedestal, sacrificial shield wall, and internal structural components)
  - Radwaste Control Building
  - Reactor Building (includes secondary containment, reactor cavity, refueling area, new fuel storage vault, release stack)
  - Service Building
  - Spray Pond 1A and 1B
  - Standby Service Water Pump House 1A and 1B
  - Station Blackout component foundations and structures in the yard (includes startup transformers TR-S, backup transformer TR-B, Ashe A809 breaker, oil circuit breaker (OCB) E-CB-TRB, and Ashe relay house)
  - Transmission Towers

- Turbine Generator Building
- Water Filtration Building

Enhancements to this element for the Structures Monitoring Program also include enhancements that are being made to the Water Control Structures Inspection. See the Water Control Structures Inspection for required enhancement details.

- **Parameters Monitored or Inspected –**

Specify that if a below grade structural wall or structural component becomes accessible through excavation; a follow-up action is initiated for the responsible engineer to inspect the exposed surfaces for age-related degradation prior to backfilling.

Identify that the term “structural component” for inspection includes component types that credit the Structures Monitoring Program for aging management.

Include the potential degradation mechanism checklist in the procedural documents. The checklist also requires enhancement to include aging effect terminology (e.g., loss of material, cracking, change in material properties, and loss of form).

Specify that the responsible engineer shall review site groundwater and raw water testing results for pH, chlorides, and sulfates prior to inspection to validate that the below-grade or raw water environments remain non-aggressive during the period of extended operation. Chemistry data shall be obtained from Columbia’s chemistry and environmental departments. Groundwater chemistry data shall be collected at least once every four years. The time of data collection shall be staggered from year to year (summer-winter-summer) to account for seasonal variations in the environment.

Enhancements to this element for the Structures Monitoring Program also include enhancements that are being made to the Water Control Structures Inspection and the Masonry Wall Inspection. See the Water Control Structures Inspection and the Masonry Wall Inspection for required enhancement details.

Operating Experience

The Structures Monitoring Program has been effective in managing the identified aging effects. Although actual experience with Structures Monitoring Program inspections is limited, recent inspection results have shown that plant structures are maintained in good condition. No significant failures have occurred in any Columbia structure to date.

Normal deterioration due to the effects of aging has been identified and effectively managed under the site maintenance program.

Visual examinations conducted by the Structures Monitoring Program have found general corrosion on steel components and concrete cracking, flaking, and scaling. Some of the currently identified concrete surface conditions have existed since original construction. These conditions are the results of typical construction practices permitted by the original specifications and design criteria. They include small shrinkage cracks, minor construction joint voids, surface irregularities, and similar conditions determined to be minor degradation that did not require further evaluation. Inspected structures are in good condition and are capable of performing their design functions.

Specific examples of age-related degradation identified by the Structures Monitoring Program include:

- Circulating water pump house - Minor leaching observed on the concrete pad near the interface with the siding, cracks in the wall along joints due to stresses caused by a hanger attached to the wall above door, corrosion on the lower section of various door frames, and minor cracking of concrete damwork around the intake bays.
- Turbine generator building - Air in-leakage noted at north exterior turbine generator building wall panels, degraded roof membrane, and minor water in-leakage from roof above.
- Radwaste control building - Some areas of concrete spalling in the switchgear rooms probably from racking breakers in and out, delaminated floor coatings, and punctured roof membrane from screws.
- Wetwell - Support steel has layer of corrosion products, condition was unchanged from previous inspections. The condition was reviewed by the material group which determined the condition of the wetwell and containment liner to be acceptable.
- Main steam tunnel - Some flaking of coating on the overhead horizontal panels, the condition was unchanged from previous inspections and determined to be acceptable.

The overall Maintenance Rule program is comprised of many existing monitoring and assessment activities that collectively address potential and actual degradation conditions. The Maintenance Rule program screens all condition reports written at Columbia. When a condition report addresses a structure issue it is reviewed by a system engineer for evaluation of a functional failure. The screening results are captured in the Maintenance Rule program periodic assessment. The review of structural-related condition reports to determine functional failure includes determination of whether failures were maintenance preventable. A review of the Maintenance Rule program periodic assessments did not identify any age-related functional failures related to structures. Two non-age related functional failures identified were that the Reactor Building crane was parked without the tornado latches installed and a 10 CFR 21 notice from Whiting Crane Corporation regarding a weld defect on the Reactor Building crane main trolley.

A recent condition report documents a surface flaw noted in the concrete of the west exterior wall of the Reactor Building. The surface flaw appears to have existed for a significant period of time with no apparent adverse effects on secondary containment or the Reactor Building structure.

NRC Unresolved Item (URI) 05000397/2007005-02 was issued in February of 2008. This URI identified that Columbia had not performed nor scheduled condition monitoring, inspection, or preventative maintenance (since receiving an operating license in 1983) of the submerged portion of the suppression chamber, the standby service water spray ponds, or the condensate storage tanks. The URI stated that although the licensee performed some monitoring of these structures, failure to perform monitoring of the submerged portion of these structures could result in undetected cracks or leakage that could prevent them from meeting their design basis functions. This URI was documented in a condition report that is currently being resolved under the corrective action process with closure information expected near the time of the LRA submittal.

The Structures Monitoring Program provides reasonable assurance that aging effects are being managed. This has been demonstrated through inspection reports, program health reports, periodic assessments, and the corrective action program.

The site corrective action program and ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The Structures Monitoring Program, with enhancements, will be capable of detecting and managing aging effects for structures within the scope of license renewal. The continued implementation of the Structures Monitoring Program, with the required enhancements, provides reasonable assurance that the effects of aging will be managed so that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.51 Supplemental Piping/Tank Inspection

Program Description

The Supplemental Piping/Tank Inspection is a new one-time inspection that will detect and characterize the material condition of steel, gray cast iron, and stainless steel components that are exposed to moist air environments, particularly the aggressive alternate wet and dry environment that exists at air-water interfaces or air spaces of susceptible piping and tanks. The inspection provides direct evidence as to whether, and to what extent, loss of material due to crevice, galvanic, general, and pitting corrosion, or MIC has occurred or is likely to occur that could result in a loss of intended function of the subject components.

Implementation of the Supplemental Piping/Tank Inspection will ensure that the pressure boundary integrity of susceptible safety-related components is maintained consistent with the current licensing bases during the period of extended operation. Implementation of the inspection will also ensure that the structural integrity of susceptible NSR components will be maintained such that spatial interactions (e.g., leakage) will not result in the loss of any safety-related component intended functions during the period of extended operation.

NUREG-1801 Consistency

The Supplemental Piping/Tank Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Supplemental Piping/Tank Inspection includes the internal and external surfaces of steel, gray cast iron, and stainless steel components at air-water interfaces and other susceptible locations in the following systems:

  - Condensate (Nuclear) (COND) System
  - Containment Vacuum Breakers (CVB)
  - Diesel Cooling Water (DCW) System
  - Equipment Drains Radioactive (EDR) System

- Fire Protection (FP) System
- Floor Drain (FD) System
- Floor Drain Radioactive (FDR) System
- Fuel Pool Cooling (FPC) System
- High Pressure Core Spray (HPCS) System
- Low Pressure Core Spray (LPCS) System
- Main Steam (MS) System
- Miscellaneous Drain (MD) System
- Process Sampling Radioactive (PSR) System
- Reactor Building Outside Air (ROA) System
- Reactor Closed Cooling Water (RCC) System
- Reactor Core Isolation Cooling (RCIC) System
- Residual Heat Removal (RHR) System
- Standby Liquid Control (SLC) System
- Standby Service Water (SW) System
- Tower Makeup Water (TMU) System

A representative sample of components at susceptible locations will be examined for evidence of loss of material (due to crevice, galvanic, general, or pitting corrosion, or MIC), or to confirm a lack thereof.

The Supplemental Piping/Tank Inspection focuses on a limited but representative sample population of subject components at susceptible locations to be defined in the implementing documents, to include external piping surfaces and internal tank and piping surfaces at air-water interfaces. The inspections provide symptomatic evidence of loss of material at the other susceptible, but possibly inaccessible, locations (such as internal surfaces of piping) due to the similarities in materials and environmental conditions.

- Preventive Actions
  No actions are taken as part of the Supplemental Piping/Tank Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Supplemental Piping/Tank Inspection include wall thickness or visual evidence of internal and external surface degradation, as measures of loss of material. Inspections will be performed by qualified personnel

using established NDE techniques (i.e., ultrasonic examination). Visual inspection of tank internals for evidence of corrosion and corrosion products may be performed.

- Detection of Aging Effects
  The Supplemental Piping/Tank Inspection will use a combination of established volumetric and visual examination techniques (such as equivalent to VT-1 or VT-3) performed by qualified personnel on a sample population of subject components to identify evidence of a loss of material.

  A sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and the lowest design margins.

  The Supplemental Piping/Tank Inspection will be conducted within the 10-year period prior to the period of extended operation.

- Monitoring and Trending
  This one-time inspection activity is used to characterize conditions and determine if, and to what extent, further actions may be required. The activity includes provisions for increasing the inspection sample size and location if degradation is detected.

  The sample size will be determined by engineering evaluation of the materials of construction, the environment (i.e., service conditions), aging effects, and of operating experience (e.g., time in-service, most susceptible locations, lowest design margins, etc.). Inspection findings that do not meet the acceptance criteria will be evaluated using the corrective action process to determine the need for subsequent aging management activities and for monitoring and trending of the results.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Supplemental Piping/Tank Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effect. The activity provides confirmation of conditions where degradation is not expected, has not evidenced as a problem, or where the aging mechanism is slow acting.

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  A review of Columbia operating experience did not identify any aging effects that were attributed to air-water interfaces or other susceptible locations. The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program is effective in managing the identified aging effects.

Required Enhancements

Not applicable, this is a new activity.

Conclusion

Implementation of the Supplemental Piping/Tank Inspection will verify that there are no aging effects requiring management for the subject components or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions of the subject components will be maintained consistent with the current licensing basis during the period of extended operation, and that spatial interactions (e.g., leakage) will not result in loss of safety-related component intended functions during the period of extended operation.

B.2.52 Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program

Program Description

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will manage reduction of fracture toughness due to thermal aging and neutron irradiation embrittlement of CASS reactor vessel internals. This program augments the visual inspection of the reactor vessel internals done in accordance with the ASME Code, Section XI, Subsection IWB, Category B-N-2 (B-N-2 versus B-N-3 as BWRs do not have B-N-3 components) and in accordance with the BWRVIP program documents. This program will consist of (a) identification of susceptible components followed by aging management accomplished through either (b) a component-specific evaluation or (c) a supplemental examination. The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a condition monitoring program with no actions to prevent or mitigate aging effects. The program will be implemented by analyses and augmenting of the Inservice Inspection program completed prior to the period of extended operation.

(a) identification of susceptible components

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will screen reactor vessel internals components to determine which components are susceptible to reduction of fracture toughness due to the combination of thermal aging and neutron embrittlement on the basis of casting method, molybdenum content, and ferrite content.

Columbia has no cast austenitic stainless steel reactor coolant pressure boundary components that are exposed to high levels of neutron irradiation; therefore there are no pressure boundary components in this program.

(b) a component-specific evaluation

Components identified as susceptible by the screening will be individually evaluated for susceptibility based on neutron fluence and component material properties following the guidelines in NUREG/CR-4513, Revision 1. Component-specific evaluations may include a mechanical loading assessment. If no component-specific evaluation is performed, or if the evaluation does not eliminate the need for inspection, the components will be inspected

(c) a supplemental examination

Examination techniques will be developed considering the recommendations of NUREG-1801 Section XI.M13. As determined necessary, nondestructive examinations (including visual, ultrasonic, and surface techniques) will be performed by qualified personnel following procedures consistent with ASME Section XI and 10 CFR 50, Appendix B. Supplemental examination of screened components will be performed as augmented inspections in the Columbia 10-year Inservice Inspection (ISI) program.

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new aging management program that will be implemented prior to the period of extended operation.

The program credits portions of the Inservice Inspection (ISI) Program (ASME Code Section XI, Subsection IWB, Category B-N-2) and the BWR Vessel Internals Program (jet pump inspections per BWRVIP-41 Revision 1 and control rod guide tubes and fuel support pieces per BWRVIP-47A).

NUREG-1801 Consistency

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)."

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will screen reactor vessel internals components to determine which components are susceptible to reduction of fracture toughness due to the combination of thermal aging and neutron embrittlement on the basis of casting method, molybdenum content, and ferrite content. For such components, the program will include either a supplemental examination, based on the neutron fluence to which the component has been exposed, as part of the Inservice Inspection (ISI) Program or the BWR Vessel Internals Program during the license renewal term, or a component-specific evaluation to determine its susceptibility to reduction of fracture toughness.

  Columbia has no cast austenitic stainless steel reactor coolant pressure boundary components that are exposed to high levels of neutron irradiation; therefore there are no pressure boundary components in this program.

- Preventive Actions
  The Columbia program will be an evaluation and inspection program with no actions to prevent or mitigate aging effects. The program will be implemented by analyses and augmenting of the Inservice Inspection program. (See *Detection of Aging Effects* below.)

- Parameters Monitored or Inspected
  The Columbia program will screen components based on material properties as discussed under the program *Scope* element above. Components identified as susceptible by the screening will be individually evaluated for susceptibility based on neutron fluence and component material properties following the guidelines in NUREG/CR-4513, Revision 1. Those components evaluated to require inspection will be inspected by augmentation of the Inservice Inspection program as discussed under *Detection of Aging Effects* below.

- Detection of Aging Effects
  The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will first screen components as discussed under *Scope* above, then evaluate those components screened as susceptible to reduction of fracture toughness as discussed above under *Parameters Monitored or Inspected*. Those components, or portions of components, determined to be susceptible to cracking from thermal aging and radiation embrittlement may then be given a component-specific evaluation, including a mechanical loading assessment. If no component-specific evaluation is performed, or if the evaluation does not eliminate the need for inspection, the components will be inspected by augmenting the Inservice Inspection (ISI) Program or the BWR Vessel Internals Program. Supplemental inspections will be added to the 10-year ISI Program Plan for the interval that includes the beginning of the period of extended operation. Examination techniques will be developed considering the recommendations of NUREG-1801 Section XI.M13. As determined necessary, nondestructive examinations (including visual, ultrasonic, and surface techniques) will be performed by qualified personnel following procedures consistent with ASME Section XI and 10 CFR 50, Appendix B.

  The activities associated with component screening, susceptibility evaluation, component-specific evaluation, augmenting of the Inservice Inspection (ISI) Program or the BWR Vessel Internals Program, and adding supplemental inspections to the 10-year ISI Program Plan will be completed prior to the period of extended operation.

- Monitoring and Trending
  The Inservice Inspection (ISI) Program already inspects in accordance with ASME Section XI and IWB-2400. Any augmented inspections resulting from the screening and evaluation discussed above under *Scope* and *Parameters Monitored or*

Inspected will be added to the Inservice Inspection (ISI) Program or the BWR Vessel Internals Program as discussed under *Detection of Aging Effects*.

- Acceptance Criteria
  There are no pressure boundary components in this program. Acceptance criteria for flaws detected in CASS components will be developed based on the ASME Section XI criteria and the BWRVIP guidance applicable to the component under evaluation. Flaw evaluation for CASS components with greater than 25 percent ferrite content will be developed on a case-by-case basis using fracture toughness data.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

  Industry operating experience:

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program. As such, operating experience assures that implementation of the Thermal Aging and Neutron Irradiation Embrittlement of CASS Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Columbia operating experience:

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program for which there is no site-specific operating experience. A review of Columbia operating experience identified no degradation of CASS vessel internals Vessel internals has been inspected and some indications found, such as core shroud cracking and jet pump set screw gaps, and those indications have been dispositioned. However, no indications have been found for CASS vessel internals components.

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will be developed based on relevant plant and industry operating experience. The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the new program is effective in managing the identified aging effects.

Required Enhancements

Not applicable, this is a new program.

Conclusion

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will be capable of managing reduction of fracture toughness for cast austenitic stainless steel components of the reactor vessel internals. The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will provide reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.53 Water Control Structures Inspection

Program Description

The Water Control Structures Inspection is implemented as part of the Structures Monitoring Program conducted for the Maintenance Rule.

The Water Control Structures Inspection is an existing condition monitoring program for detecting aging and age-related degradation of the Seismic Category I Spray Ponds and the Standby Service Water Pump Houses. It also inspects the Seismic Category II Circulating Water Pump House (including the circulating water basin), the Makeup Water Pump House, and the cooling tower basins.

Columbia is not committed to RG 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants." However, enhancements pertaining to water control structure inspection elements from RG 1.127 Revision 1 will be incorporated into the Structures Monitoring Program consistent with NUREG-1801, Section XI.S7.

NUREG-1801 Consistency

The Water Control Structures Inspection is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants."

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Scope, Parameters Monitored or Inspected –**

  Include and list the water control structures within the scope of license renewal. Include the RG 1.127 Revision 1 inspection elements for water control structures, including submerged surfaces. Ensure descriptions of concrete conditions conform with the appendix to the American Concrete Institute (ACI) publication, ACI 201, "Guide for Making a Condition Survey of Concrete in Service." Add a recommendation to use photographs for comparison of previous and present conditions. Add a requirement for the documentation of new or progressive problems as a part of the inspection program.

Operating Experience

The Water Control Structures Inspection has been effective in managing the identified aging effects. Visual inspections conducted by the Water Control Structures Inspection, implemented as part of the Structures Monitoring Program, have found no age-related problems.

The general structural condition of Standby Service Water Pump Houses “A” and “B” and their associated spray ponds is good. No adverse conditions or deficiencies (cracking, spalling, or honeycombs) were noted during the inspection of concrete structural elements (walls, slabs, beams, etc.) that would affect the structural integrity of either pump house or spray pond. Equipment anchorages were secured. No degraded conditions (bent or twisted members, cracked welds, loose or missing fasteners, etc) were identified for steel members. The “saddle” supports for the ring header were noted to have the coating delaminating in places. However, there were only minor amounts of corrosion products at those locations (i.e., not a structural concern). Pipe supports on spray pond walls were in good shape with all fasteners installed and tight. Doors and frames did not show any evidence of a degraded condition. There were no signs of moisture intrusion from the roof above and no signs of gross deficiencies (spalling, cracking, honeycombs) found from below. There were no obvious deficiencies identified with the crane structural frames. The rails appeared in good physical condition with no obvious signs of degradation such as bent or deformed rails. The Standby Service Water Pump Houses and the Spray Ponds are capable of performing their intended design function as the ultimate heat sink in response to accident conditions.

NRC Unresolved Item (URI) 05000397/2007005-02 was issued in February of 2008. This URI identified that Columbia had not performed nor scheduled condition monitoring, inspection, or preventative maintenance (since receiving an operating license in 1983) of the submerged portion of the suppression chamber, the standby service water spray ponds, or the condensate storage tanks. The URI stated that although the licensee performed some monitoring of these structures, failure to perform monitoring of the submerged portion of these structures could result in undetected cracks or leakage that could prevent them from meeting their design basis functions. This URI was documented in a condition report that is currently being resolved under the corrective action process with closure information expected near the time of the LRA submittal.

The general conditions noted for the Circulating Water Pump House (including circulating water basin) and the cooling tower basins, including the structural components within the structures, was acceptable. Minor leaching was observed in the Circulating Water Pump House on a concrete pad near the interface with the siding, in addition to cracks in the wall along joints due to stresses caused by a hanger attached to the wall above the door, corrosion on the lower section of various door frames, and minor cracking of concrete damwork around the intake bays. No condition was deemed to require immediate or long-term resolution. Minor "cosmetic" imperfections with the concrete (blemishes, cure voids, surface cracks, etc.) were noted. These minor imperfections will continue to be monitored, but they currently pose no concern to the structural condition of the area.

The Water Control Structures Inspection, implemented as part of the Structures Monitoring Program, provides reasonable assurance that aging effects are being managed for Columbia's water control structures. This has been demonstrated through inspection reports, program health reports, and the corrective action program.

The site corrective action program and ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The Water Control Structures Inspection with enhancements, as part of the Structures Monitoring Program, will be capable of detecting and managing aging effects for structures within the scope of license renewal. The continued implementation of the Water Control Structures Inspection, with the required enhancements, provides reasonable assurance that the effects of aging will be managed so that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

APPENDIX C

RESPONSE TO BWRVIP APPLICANT ACTION ITEMS

[This page intentionally blank]

BWRVIP Report Applicant Action Items

The following Boiling Water Reactor Vessel Internals Project (BWRVIP) documents credited for Columbia license renewal have NRC safety evaluation reports (SERs).

- Table C-1 BWRVIP-18-A - BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines
- Table C-2 BWRVIP-25 - BWR Core Plate Inspection and Flaw Evaluation Guidelines
- Table C-3 BWRVIP-26-A - BWR Top Guide Inspection and Flaw Evaluation Guidelines
- Table C-4 BWRVIP-27-A - BWR Standby Liquid Control System/Core Plate DP Inspection and Flaw Evaluation Guidelines
- Table C-5 BWRVIP-38 - BWR Shroud Support Inspection and Flaw Evaluation Guidelines
- Table C-6 BWRVIP-41 - BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines
- Table C-7 BWRVIP-42-A - LPCI Coupling Inspection and Flaw Evaluation Guidelines
- Table C-8 BWRVIP-47-A - BWR Lower Plenum Inspection and Flaw Evaluation Guidelines
- Table C-9 BWRVIP-48-A - Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines
- Table C-10 BWRVIP-49-A - Instrument Penetration Inspection and Flaw Evaluation Guidelines
- Table C-11 BWRVIP-74-A - BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal
- Table C-12 BWRVIP-116 - BWR Vessel and Internals Project Integrated Surveillance Program (ISP) Implementation for License Renewal

License renewal Applicant Action Items (AAIs) identified in the corresponding SERs for each of the above BWRVIP reports are addressed in the following tables. A plant-specific response is provided for each AAI. The table for BWRVIP-116 (Table C-12) contains required modifications to the BWRVIP Integrated Surveillance Program (ISP) called for in the SER; however, the SER does not contain any applicant action items. BWRVIP-76 is not included because the SER has not yet been issued. BWRVIP reports without SERs for license renewal have no AAIs; therefore, no tables are provided.

Table C-1

BWRVIP-18-A BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-18 report to manage the effects of aging on the functionality of the core spray internals during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-18 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor pressure vessel components or other information presented in the report, such as materials of construction, will have to be identified by the LR applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The BWR Vessel Internals Program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at Columbia. Site procedures require a technical justification to be documented, and the NRC to be notified, for any deviation from the guidelines. Columbia has not identified any deviation from the BWRVIP-18-A guidelines. Therefore, Columbia is bounded by the BWRVIP-18-A report. Columbia commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAAs for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-18 report for the core spray internals shall ensure that the programs and activities specified as necessary in the BWRVIP-18 report are summarily described in the FSAR supplement.	The FSAR supplement, contained in Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

Table C-1

BWRVIP-18-A BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix C to the BWRVIP-18 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the core spray internals as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-18 report for the core spray internals shall ensure that the inspection strategy described in the BWRVIP-18 report does not conflict with or result in any changes to their technical specifications. If technical specification changes do result, then the applicant must ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-18-A report.
(4) Applicants referencing the BWRVIP-18 report for license renewal should identify and evaluate any potential TLAA issues which may impact the structural integrity of the subject RPV internal components.	The only TLAA issues identified for the reactor pressure vessel (RPV) internal core spray components were the CUFs in LRA Table 4.3-4 for the core spray sparger and core spray piping. Disposition of these TLAAs is discussed in Section 4.3.2.1 of the LRA.

Table C-2

BWRVIP-25 BWR Core Plate Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the BWRVIP-25 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-25 report to manage the effects of aging on the functionality of the core plate assembly during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMPs within the BWRVIP-25 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The BWR Vessel Internals Program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at Columbia. Site procedures require a technical justification to be documented, and the NRC to be notified, for any deviation from the guidelines. Columbia has not identified any deviation from the BWRVIP-25 guidelines. Therefore, Columbia is bounded by the BWRVIP-25 report. Columbia commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAAs for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-25 report for the core plate will ensure that the programs and activities specified as necessary in the BWRVIP-25 report are summarily described in the FSAR supplement.	BWRVIP-25 requires inspection of the core plate rim hold-down bolts for those plants that use these bolts to prevent lateral motion of the core plate. As described in response to AAI #4, Columbia has wedges installed to perform this function. Thus Columbia complies with the second option of BWRVIP-25, to install wedges rather than inspect the core plate rim hold-down bolts. Therefore, no programs or activities are required and no summary description is provided in the FSAR supplement, contained in Appendix A of the LRA.

Table C-2

BWRVIP-25 BWR Core Plate Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix B to the BWRVIP-25 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the core plate as a result of its AMR and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-25 report for the core plate will ensure that the inspection strategy described in the BWRVIP-25 report does not conflict with or result in any changes to their technical specifications (TS). If TS changes do result, then the applicant must ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-25 report.
(4) Due to susceptibility of the rim hold-down bolts to stress relaxation, applicants referencing the BWRVIP-25 report for license renewal should identify and evaluate the projected stress relaxation as a potential TLAA issue.	Stress relaxation of the core plate rim hold-down bolts is not a TLAA for Columbia. During original fabrication of the Columbia reactor internals, wedges were installed to prevent lateral motion of the core plate, and Columbia does not require the core plate rim hold-down bolts for this function.
(5) Until such time as an expanded technical basis for not inspecting the rim hold-down bolts is approved by the staff, applicants referencing the BWRVIP-25 report for license renewal should continue to perform inspections of the rim hold-down bolts.	BWRVIP-25 requires inspection of the core plate rim hold-down bolts for those plants that use these bolts to prevent lateral motion of the core plate. As described in response to AAI #4, Columbia has wedges installed to perform this function. Thus Columbia complies with the second option of BWRVIP-25, to install wedges rather than inspect the core plate rim hold-down bolts.

Table C-3

BWRVIP-26-A BWR Top Guide Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the topical report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-26 report to manage the effects of aging on the functionality of the top guide structure during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMPs within the BWRVIP-26 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The BWR Vessel Internals Program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at Columbia. Site procedures require a technical justification to be documented, and the NRC to be notified, for any deviation from the guidelines. Columbia has not identified any deviation from the BWRVIP-26-A guidelines. Therefore, Columbia is bounded by the BWRVIP-26-A report. Columbia commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-26 report for the top guide system shall ensure that the programs and activities specified as necessary in the BWRVIP-26 report are summarily described in the FSAR supplement.	The FSAR supplement, contained in Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

Table C-3

BWRVIP-26-A BWR Top Guide Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix C to the BWRVIP-26 report, the BWRVIP stated that there are no generic changes or additions to technical specifications (TS) associated with the top guide as a result of its AMR and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-26 report for the top guide shall ensure that the inspection strategy described in the BWRVIP-26 report does not conflict or result in any changes to their TS. If TS changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-26-A report.
(4) Due to IASCC susceptibility of the subject safety-related components, applicants referencing the BWRVIP-26 report for license renewal should identify and evaluate the projected accumulated neutron fluence as a potential TLAA issue.	Accumulated neutron fluence for the top guide is not a TLAA for Columbia. The top guide has exceeded the threshold fluence levels for IASCC identified in BWRVIP-26-A. The aging effect is managed per the inspection recommendations in BWRVIP-183, which includes the inspections recommended by NUREG-1801 for the period of extended operation.

Table C-4

BWRVIP-27-A BWR Standby Liquid Control System/Core Plate DP Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP report to manage the effects of aging on the functionality of the DP/SLC vessel penetration/nozzle and safe-end extensions during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within this BWRVIP report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	Columbia does not inject standby liquid control (SLC) through the SLC differential pressure (DP) nozzle, rather Columbia injects through the high pressure core spray line. Thus, consistent with Section 1.1 of BWRVIP-27-A, this BWRVIP document does not apply to Columbia.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAAs for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-27 report for the DP/SLC vessel penetration/nozzle and safe end extensions shall ensure that the programs and activities specified as necessary in the BWRVIP-27 document are summarily described in the FSAR supplement.	As described in response to AAI #1, BWRVIP-27-A does not apply to Columbia. Therefore, no programs or activities are required and no summary description is provided in the FSAR supplement, contained in Appendix A of the LRA.

Table C-4

BWRVIP-27-A BWR Standby Liquid Control System/Core Plate DP Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix B to the BWRVIP-27 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the DP/SLC vessel penetration/nozzle and safe-end extensions as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing BWRVIP-27 for the DP/SLC vessel penetration/nozzle and safe-end extensions shall ensure that the inspection strategy described in the BWRVIP-27 document does not conflict with or result in any changes to their technical specifications. If technical specification changes do result, then the applicant must ensure that those changes are included in its application for license renewal.	As described in response to AAI #1, BWRVIP-27-A does not apply to Columbia. Therefore, no technical specification changes are required for the inspection strategy described in the BWRVIP-27-A report.
(4) Due to the susceptibility of the subject components to fatigue, applicants referencing the BWRVIP-27 report for license renewal should identify and evaluate the projected fatigue cumulative usage factors as a potential TLAA issue.	As described in response to AAI #1, BWRVIP-27-A does not apply to Columbia. The only TLAA identified for the standby liquid control differential pressure (SLC/DP) line is the cumulative usage factor for the (core DP) nozzle stub tube. This is addressed in Section 4.3.1 (Table 4.3-3) of the LRA.

Table C-5

BWRVIP-38 BWR Shroud Support Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the topical report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-38 report to manage the effects of aging on the functionality of the shroud support components during the period of extended operation, including actions planned to inspect welds that are presently inaccessible. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-38 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The BWR Vessel Internals Program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at Columbia. Site procedures require a technical justification to be documented, and the NRC to be notified, for any deviation from the guidelines. Columbia has not identified any deviation from the BWRVIP-38 guidelines. Therefore, Columbia is bounded by the BWRVIP-38 report. Columbia commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) An FSAR supplement is required by 10 CFR 54.21 (d) for the facility and must contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-38 report for the shroud support shall ensure that the programs and activities specified as necessary in the BWRVIP-38 report are summarily described in the FSAR supplement.	The FSAR supplement, contained in Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

Table C-5

BWRVIP-38 BWR Shroud Support Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) Each application for license renewal is required by 10 CFR 54.22 to include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix B to the BWRVIP-38 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the shroud support as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-38 report for the shroud support shall ensure that the inspection strategy described in the BWRVIP-38 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-38 report.

Table C-6

BWRVIP-41 BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the BWRVIP-41 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-41 report to manage the effects of aging on the functionality of the jet pump components during the period of extended operation, including actions planned to mitigate the issue concerning the inspection of welds that are presently inaccessible, and the thermal and/or neutron embrittlement TLAA. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-41 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The BWR Vessel Internals Program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at Columbia. Site procedures require a technical justification to be documented, and the NRC to be notified, for any deviation from the guidelines. Columbia has not identified any deviation from the BWRVIP-41 guidelines. Therefore, Columbia is bounded by the BWRVIP-41 report. Columbia commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-41 report for the jet pump components shall ensure that the programs and activities specified as necessary in the BWRVIP-41 report are summarily described in the FSAR supplement.	The FSAR supplement, contained in Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

Table C-6

BWRVIP-41 BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix A to the BWRVIP-41 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the jet pump assembly as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-41 report for the jet pump assembly shall ensure that the inspection strategy described in the BWRVIP-41 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-41 report.

Table C-7

BWRVIP-42-A LPCI Coupling Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the BWRVIP-42 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-42 report to manage the effects of aging on the functionality of the LPCI coupling during the period of extended operation, including actions planned to inspect welds that are presently inaccessible. If corrective actions are necessary, the applicant shall either commit to follow the guidance in the staff-approved BWRVIP-56 report, "LPCI Coupling Repair Design Criteria," or describe the process that will be utilized to repair the LPCI couplings if needed. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-42 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The BWR Vessel Internals Program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at Columbia. Site procedures require a technical justification to be documented, and the NRC notified, for any deviation from the guidelines. Columbia deviation DD-06 documents that the re-inspection of the first low-pressure coolant injection (LPCI) coupling was not completed as scheduled. The LPCI coupling was inspected during the last refueling outage (R19) and the other couplings will be inspected as originally scheduled; completing the first round of re-inspections required by BWRVIP-42-A. Therefore, Columbia is bounded by the BWRVIP-42-A report. Columbia commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.

Table C-7

BWRVIP-42-A LPCI Coupling Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAAs for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-42 report for the LPCI coupling internals shall ensure that the programs and activities specified as necessary in the BWRVIP-42 report are summarily described in the FSAR supplement.	The FSAR supplement, contained in Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.
(3) 10 CFR 54.22 requires each applicant for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix A to the BWRVIP-42 report, the BWRVIP stated that there are no generic changes or additions to technical specifications associated with the LPCI coupling as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-42 report for the LPCI coupling internals shall ensure that the inspection strategy described in the BWRVIP-42 report does not conflict with or result in any changes to their technical specifications. If technical specification changes do result, then the applicant must ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-42-A report.
(4) Applicants referencing the BWRVIP-42 report for license renewal should identify and evaluate any potential TLAA issues which may impact the structural integrity of the subject RPV internal components.	The only TLAA identified for the LPCI coupling is the cumulative usage factor for the coupling. This is addressed in Section 4.3.2 (Table 4.3-4) of the LRA.

Table C-7

BWRVIP-42-A LPCI Coupling Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(5) The BWRVIP committed to address development of the technology to inspect inaccessible welds and to have the individual LR applicant notify the NRC of actions planned. Applicants referencing the BWRVIP-42 report for license renewal should identify this action as open and to be addressed once the BWRVIP's response to this issue has been reviewed and accepted by the staff.	In accordance with the BWR Vessel Internals Program, Columbia will implement the additional inspection requirements of BWRVIP-42-A once those requirements are approved by the NRC staff.

Table C-8

BWRVIP-47-A BWR Lower Plenum Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The LR applicant is to verify that its plant is bounded by the BWRVIP-47 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-47 report to manage the effects of aging on the functionality of the lower plenum during the period of extended operation. LR applicants will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMPs within the BWRVIP-47 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The BWR Vessel Internals Program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at Columbia. Site procedures require a technical justification to be documented, and the NRC notified, for any deviation from the guidelines. Columbia has not identified any deviation from the BWRVIP-47-A guidelines. Therefore, Columbia is bounded by the BWRVIP-47-A report. Columbia commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for LR referencing the BWRVIP-47 report for the lower plenum shall ensure that the programs and activities specified as necessary in the BWRVIP-47 report are summarily described in the FSAR supplement.	The FSAR supplement, contained in Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

Table C-8

BWRVIP-47-A BWR Lower Plenum Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each LR application include any TS changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the LR application. In its Appendix A to the BWRVIP-47 report, the BWRVIP stated that there are no generic changes or additions to TSs associated with the lower plenum as a result of its AMR and that the applicant will provide the justification for plant-specific changes or additions. Those LR applicants referencing the BWRVIP-47 report for the lower plenum shall ensure that the inspection strategy described in the BWRVIP-47 report does not conflict or result in any changes to their TSs. If technical specification changes do result, then the applicant should ensure that those changes are included in its LR application.	No technical specification changes are required for the inspection strategy described in the BWRVIP-47-A report.
(4) Due to fatigue of the subject safety-related components, applicants referencing the BWRVIP-47 report for LR should identify and evaluate the projected CUF as a potential TLAA issue.	The only TLAAs identified for the lower plenum are the cumulative usage factors for the control rod drive (CRD) housings, CRD stub tubes, and incore housing penetrations. These are addressed in Section 4.3.1 (Table 4.3-3) of the LRA.

Table C-9

BWRVIP-48-A Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the BWRVIP-48 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-48 report to manage the effects of aging on the functionality of the bracket attachments during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-48 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The BWR Vessel Internals Program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at Columbia. Site procedures require a technical justification to be documented, and the NRC to be notified, for any deviation from the guidelines. Columbia has not identified any deviation from the BWRVIP-48-A guidelines. Therefore, Columbia is bounded by the BWRVIP-48-A report. Columbia commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-48 report for the bracket attachments shall ensure that the programs and activities specified as necessary in the BWRVIP-48 report are summarily described in the FSAR supplement.	The FSAR supplement, contained in Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

Table C-9

BWRVIP-48-A Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix A to the BWRVIP-48 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the bracket attachments as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-48 report for the bracket attachments shall ensure that the inspection strategy described in the BWRVIP-48 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-48-A report.

Table C-10

BWRVIP-49-A Instrument Penetration Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the topical report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP report to manage the effects of aging on the functionality of the reactor vessel instrument penetrations during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within this BWRVIP report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The BWR Vessel Internals Program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at Columbia. Site procedures require a technical justification to be documented for any deviation from the guidelines. Columbia has not identified any deviation from the BWRVIP-49-A guidelines. Therefore, Columbia is bounded by the BWRVIP-49-A report. Columbia commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP- 49 report for the instrument penetrations shall insure that the programs and activities specified as necessary in the BWRVIP-49 report are summarily described in the FSAR supplement.	The FSAR supplement, contained in Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

Table C-10

BWRVIP-49-A Instrument Penetration Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix A to the BWRVIP-49 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with instrument penetrations as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing BWRVIP-49 for the instrument penetrations shall ensure that the inspection strategy described in the BWRVIP-49 document does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-49-A report.

Table C-11

BWRVIP-74-A BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal	
Applicant Action Item Text	**Plant-Specific Response**
(1) The LR applicant is to verify that the BWRVIP-74 report is applicable to its plant. Further, the LR applicant is to commit to programs described as necessary in the BWRVIP-74 report to manage the effects of aging on the functionality of the RPV components during the period of extended operation. LR applicants will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMP within the BWRVIP-74 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the LR applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The BWR Vessel Internals Program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at Columbia. Site procedures require a technical justification to be documented for any deviation from the guidelines. Columbia has not identified any deviation from the BWRVIP-74-A guidelines. Therefore, Columbia is bounded by the BWRVIP-74-A report. Columbia commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those LR applicants referencing the BWRVIP-74 report for the RPV components shall ensure that the programs and activities specified as necessary in the BWRVIP-74 report are summarily described in the FSAR supplement.	The FSAR supplement, contained in Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

Table C-11

BWRVIP-74-A BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each LR application include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the LR application. In its Appendix A to the BWRVIP-74 report, the BWRVIP stated that the technical specification changes resulting from neutron embrittlement will be made at the appropriate time prior to the end of the current license. Those LR applicants referencing the BWRVIP-74 report for the RPV components shall ensure that the inspection strategy described in the BWRVIP-74 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its LR application.	No technical specification changes are required for the inspection strategy described in the BWRVIP-74-A report. Technical specification changes due to embrittlement, i.e. Pressure-Temperature Limits, will be submitted prior to the expiration of the currently approved limits, as discussed in LRA Section 4.2.
(4) The staff is concerned that leakage around the reactor vessel seal rings could accumulate in the VFLD lines, cause an increase in the concentration of contaminants and cause cracking in the VFLD line. The BWRVIP-74 report does not identify this component as within the scope of the report. However, since the VFLD line is attached to the RPV and provides a pressure boundary function, LR applicants should identify an AMP for the VFLD line.	The reactor vessel flange leak detection (VFLD) lines are in the scope of license renewal. See the scoping and screening results in the LRA for the Reactor Coolant System Pressure Boundary (piping and fittings, flange leak detection lines, Section 2.3.1.3 and Table 3.1.2-3). Refer to Section 3.1.2.2.4 of the LRA for further information, and also see item 3.1.1-19 in LRA Table 3.1.1. Cracking of these lines is managed by the Small Bore Class 1 Piping Inspection. This aging management program is described in Appendix B of the LRA.

Table C-11

BWRVIP-74-A BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal	
Applicant Action Item Text	**Plant-Specific Response**
(5) LR applicants shall describe how each plant-specific aging management program addresses the following elements: (1) scope of program, (2) preventive actions, (3) parameters monitored or inspected, (4) detection of aging effects, (5) monitoring and trending, (6) acceptance criteria, (7) corrective actions, (8) confirmation process, (9) administrative controls, and (10) operating experience.	A description of the aging management programs credited for license renewal is provided in Appendix B of the LRA. These descriptions include a comparison of each program element to the 10 elements in the NUREG-1801 program for plant-specific programs.
(6) The staff believes inspection by itself is not sufficient to manage cracking. Cracking can be managed by a program that includes inspection and water chemistry. BWRVIP-29 describes a water chemistry program that contains monitoring and control guidelines for BWR water that is acceptable to the staff. BWRVIP-29 is not discussed in the BWRVIP-74 report. Therefore, in addition to the previously discussed BWRVIP reports, LR applications shall contain water chemistry programs based on monitoring and control guidelines for reactor water chemistry that are contained in BWRVIP-29.	As described in Appendix B of the LRA, Columbia has an existing BWR Water Chemistry Program as a preventative measure against cracking due to stress corrosion cracking and intergranular attack. As discussed in Appendix B of the LRA, the BWR Water Chemistry Program is consistent with NUREG-1801 section XI.M2. The BWR Water Chemistry Program is based periodically updated to the latest EPRI BWR water chemistry guidelines (currently BWRVIP-130).
(7) LR applicants shall identify their vessel surveillance program, which is either an ISP or plant-specific in-vessel surveillance program, applicable to the LR term.	As described in Appendix B of the LRA, the Reactor Vessel Surveillance Program is part of the ISP, described in BWRVIP-86-A and BWRVIP-116, and approved by the NRC staff.
(8) LR applicants should verify that the number of cycles assumed in the original fatigue design is conservative to assure that the estimated fatigue usage for 60 years of plant operation is not underestimated. The use of alternative actions for cases where the estimated fatigue is projected to exceed 1.0 will require case-by-case staff review and approval. Further, a LR applicant must address environmental fatigue for the components listed in the BWRVIP-74 report for the LR period.	Metal fatigue (including discussion of cycles, projected cumulative usage factors, and environmental fatigue effects) is addressed in Section 4.3 of the LRA.

Table C-11

BWRVIP-74-A BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal	
Applicant Action Item Text	**Plant-Specific Response**
(9) Appendix A to the BWRVIP-74 report indicates that 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.	The Columbia pressure-temperature (P-T) limit curves were revised in 2005 to include the effects of power uprate and are valid for 33.1 EFPY. The P-T limits will be revised when necessary to comply with 10 CFR 50 Appendix G, as discussed in Section 4.2.4 of the LRA.
(10) To demonstrate that the beltline materials meet the Charpy USE criteria in Appendix B of the report, the applicant shall demonstrate that the percent reduction in Charpy USE for their beltline materials are less than those specified for the limiting BWR3-6 plates and the non-Linde 80 submerged arc welds and that the percent reduction in Charpy USE for their surveillance weld and plate are less than or equal to the values projected using the methodology in RG 1.99, Revision 2.	The Columbia beltline materials meet the criteria in Appendix B of BWRVIP-74. Details of the Charpy upper shelf energy (USE) evaluation for the reactor vessel beltline materials are provided in Section 4.2.2 of the LRA.
(11) To obtain relief from the inservice inspection of the circumferential welds during the LR period, the BWRVIP report indicates that each licensee will have to demonstrate that (1) at the end of the renewal period, the circumferential welds will satisfy the limiting conditional failure frequency for circumferential welds in the Appendix E of the staff's July 28, 1998, FSER, and (2) that they have implemented operator training and established procedures that limit the frequency of cold overpressure events to the amount specified in the staff's FSER.	(1) The Columbia circumferential welds will satisfy the limiting conditional failure frequency for circumferential welds in Appendix E of the staff's July 28, 1998, FSER. Details are presented in Section 4.2.5 of the LRA. (2) Columbia has implemented operator training and established procedures that limit the frequency of cold overpressure events. The details were presented in Columbia's original request for relief. The NRC approval of that request (see Reference 4.8-9 in LRA Section 4.8) agreed that Columbia has implemented the necessary operator training and procedural controls.

Table C-11

BWRVIP-74-A BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal	
Applicant Action Item Text	**Plant-Specific Response**
(12) As indicated in the staff's March 7, 2000 letter to Carl Terry, a LR applicant shall monitor axial beltline weld embrittlement. One acceptable method is to determine the mean RT_{NDT} of the limiting axial beltline weld at the end of the extended period of operation is less than the values specified in Table 1 of this FSER.	The projected RT_{NDT} of Columbia's limiting axial beltline weld at the end of the extended period of operation is less than the values specified in Table 1 of the FSER for BWRVIP-74. Details of the evaluation are in Section 4.2.6 of the LRA.
(13) The Charpy USE, P-T limit, circumferential weld and axial weld RPV integrity evaluations are all dependent upon the neutron fluence. The applicant may perform neutron fluence calculations using a staff approved methodology or may submit the methodology for staff review. If the applicant performs the neutron fluence calculation using a methodology previously approved by the staff, the applicant should identify the NRC letter that approved the methodology.	Columbia used fluence methodology that was approved by the NRC based on the methodology following the guidance in Regulatory Guide (RG) 1.190. See Section 4.2.1 of the LRA.
(14) Components that have indications that have been previously analytically evaluated in accordance with Subsection IWB-3600 of Section XI to the ASME Code until the end of the 40-year service period shall be re-evaluated for the 60 year service period corresponding to the LR term.	Columbia has two indications that have been previously evaluated (one analysis) in accordance with Subsection IWB-3600 of Section XI to the ASME Code until the end of the 40-year service period. These two reactor vessel shell indications were evaluated for the period of extended operation and cracking of these indications will be managed by the Inservice Inspection (ISI) Program. Details of the evaluation are in Section 4.7.1 of the LRA.

Table C-12

BWRVIP-116 BWR Vessel and Internals Project Integrated Surveillance Program (ISP) Implementation for License Renewal	
Applicant Action Item Text	**Plant-Specific Response**
BWR licensees who wish to participate in the ISP(E) must complete the ISP(E) implementation as follows, based on the status of its license renewal application: (c) BWR licensees that will submit a license renewal application shall implement the ISP(E) by revising their licensing basis to include the approved version of BWRVIP-116 in its application and the proposed licensing basis for the extended period of operation.	As discussed in the Reactor Vessel Surveillance Program, Columbia has implemented the ISP as approved by the NRC staff. Energy Northwest will submit a licensing basis change request to implement the BWRVIP ISP(E) at least two years prior to the period of extended operation.
In addition to the information in the BWRVIP's letter dated January 11, 2005, which amends BWRVIP-116, the BWRVIP shall include in the approved version of BWRVIP-116, the following concerning the withdrawal schedule and contingency plans as discussed in this SE. a. NRC staff notes that the new capsule test schedule in Table 1 of the BWRVIP letter dated January 11, 2005, should replace Table 2-2 of BWRVIP-116.	Energy Northwest will submit a licensing basis change request to implement the BWRVIP ISP(E) at least two years prior to the period of extended operation. Columbia will implement the ISP(E) as amended by the BWRVIP letter of January 11, 2005, including the new capsule test schedule in Table 1 of that letter.

Table C-12

BWRVIP-116 BWR Vessel and Internals Project Integrated Surveillance Program (ISP) Implementation for License Renewal	
Applicant Action Item Text	**Plant-Specific Response**
b. The BWRVIP-116 report should include the necessary information to ensure the contingency plan continues to meet the criterion in Paragraph III.C.d of Appendix H to 10 CFR Part 50. This information should ensure: (1) All surveillance material with unirradiated CVN baseline data, which includes tested/broken CVN specimens and partially and/or untested surveillance capsule material, must be kept in a condition to allow for possible future testing. (2) If these surveillance material are removed from the RPV, without the intent to test them, these capsules must be stored in a manner which maintains them in a condition which would support possible re-insertion into an RPV, if necessary under the contingency plan. (3) Prior to any changes to the storage of these materials, the BWRVIP must be notified to determine whether these changes are acceptable. The BWRVIP must obtain NRC approval for any changes that would prevent the possible testing of these surveillance materials under the contingency plan.	Implementation of the BWRVIP ISP(E) for Columbia will include the following details in support of the contingency plan: (1) Energy Northwest will include the requirement to keep all tested material (irradiated or unirradiated) for possible future reconstitution and testing. (2) The Columbia site procedure has been modified to require any capsules removed from the reactor vessel to be stored in a manner that would support future re-insertion of these capsules in the reactor vessel. (3) Energy Northwest will notify the BWRVIP prior to any change in the storage of on-site materials. NRC approval will be obtained prior to any change in the storage of surveillance materials that would affect the potential use of the materials under the contingency plan. See the Reactor Vessel Surveillance Program for more details.

Table C-12

BWRVIP-116 BWR Vessel and Internals Project Integrated Surveillance Program (ISP) Implementation for License Renewal	
Applicant Action Item Text	**Plant-Specific Response**
Finally, if a BWR facility proposes to change its neutron fluence determination methodology, the facility must request approval from the NRC staff to determine its acceptability, determine whether the neutron fluence determination methodologies are compatible for use in the ISP(E) and determine if the methodologies have been or will be benchmarked against existing dosimetry data bases. The information submitted to the NRC staff must be sufficient for the staff to determine that: (1) RPV and surveillance capsule fluences will be established as based on the use of an NRC-approved fluence methodology that will provide acceptable results based on the available dosimetry data, and (2) if one methodology is used to determine the neutron fluence values for a licensee's RPV and one or more different methodologies are used to establish the neutron fluence values for the ISP(E) surveillance capsules which "represent" that RPV in the ISP, the results of these differing methodologies are compatible (i.e., within acceptable levels of uncertainty for each calculation).	Columbia does not propose to change its neutron fluence determination methodology. Neutron fluence methodology is discussed in LRA Section 4.2.

[This page intentionally blank]

APPENDIX D

TECHNICAL SPECIFICATION CHANGES

10 CFR 54.22 requires that an application for license renewal include any technical specification changes or additions necessary to manage the effects of aging during the period of extended operation.

No changes to the Columbia Technical Specifications are required to support the License Renewal Application.

[This page intentionally blank]