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United States Nuclear Regulatory Commission
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NUREG-2191, Vol. 1

Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report

Draft Report for Comment

Office of Nuclear Reactor Regulation

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Any interested party may submit comments on this report for consideration by the U.S. Nuclear Regulatory Commission (NRC) staff. Comments may be accompanied by additional relevant information or supporting data. Please specify the report number **NUREG–2192** in your comments, and send them by the end of the comment period specified in the *Federal Register* notice announcing the availability of this report.

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ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC) staff has defined subsequent license renewal (SLR) to be the period of extended operation from 60 years to 80 years of nuclear power plant operation. NUREG–2191, “Generic Aging Lessons Learned for Subsequent License Renewal Report,” provides guidance for SLR applicants. The Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report contains the NRC staff’s generic evaluation of plant aging management programs (AMPs) and establishes the technical basis for their adequacy. The GALL-SLR Report contains recommendations on specific areas for which existing AMPs should be augmented for SLR. An applicant may reference this report in an SLR application to demonstrate that the AMPs at the applicant’s facility correspond to those described in the GALL-SLR Report. If an applicant credits an AMP in the GALL-SLR Report, it is incumbent on the applicant to ensure that the conditions and operating experience (OE) at the plant are bounded by the conditions and OE for which the GALL-SLR Report program was evaluated. If these bounding conditions are not met, it is incumbent on the applicant to address any additional aging effects and augment the AMPs for SLR. For AMPs that are based on the GALL-SLR Report, the NRC staff will review and verify whether the applicant’s AMPs are consistent with those described in the GALL-SLR Report, including applicable plant conditions and OE. The focus of the NRC staff’s review of an SLR application is on those AMPs that an applicant has enhanced to be consistent with the GALL-SLR Report, those AMPs for which the applicant has taken an exception to the program described in the GALL-SLR Report, and plant-specific AMPs not described in the GALL-SLR Report. The information in the GALL-SLR Report has been incorporated into the NUREG–2192, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants,” as directed by the Commission, to improve the efficiency of the SLR process.

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ABBREVIATIONS

ACAR	aluminum conductor aluminum alloy reinforced
ACSR	aluminum conductor steel reinforced
ACI	American Concrete Institute
ADAMS	Agencywide Documents Access and Management System
ADS	automatic depressurization system
AEA	Atomic Energy Act
AEC	Atomic Energy Commission
AFW	auxiliary feedwater
AERM	aging effect requiring management
AISC	American Institute of Steel Construction
Al	Aluminum
ALARA	as low as reasonably achievable
AMPs	aging management programs
AMR	aging management review
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	ASTM International
B&PV	boiler and pressure vessel
B&W	Babcock & Wilcox
BWR	boiling water reactor
BWRVIP	Boiling Water Reactor Vessel and Internals Project
CASS	cast austenitic stainless steel
CB	core barrel
CCCW	closed-cycle cooling water
CE	Combustion Engineering
CEA	control element assembly
CFR	*Code of Federal Regulations*
CFS	core flood system
CLB	current licensing basis
CRD	control rod drive
CRDM	control rod drive mechanism
CRDRL	control rod drive return line
CRGT	control rod guide tube
CVCS	chemical and volume control system
DC	direct current
DHR	decay heat removal
DLR	Division of License Renewal

DOE	U.S. Department of Energy
DSCSS	drywell and suppression chamber spray system
EDG	emergency diesel generator
EMDA	Expanded Materials Degradation Assessment
EPDM	ethylene propylene diene monosomer
EPR	ethylene-propylene rubber
EPRI	Electric Power Research Institute
EQ	environmental qualification
FAC	flow-accelerated corrosion
FERC	Federal Energy Regulatory Commission
FRN	Federal Register Notice
FSAR	Final Safety Analysis Report
FW	feedwater
GALL	Generic Aging Lessons Learned
GALL-SLR	Generic Aging Lessons Learned for Subsequent License Renewal
GE	General Electric
GL	generic letter
HDPE	high density polyethylene
HELB	high-energy line break
HP	high pressure
HPCI	high-pressure coolant injection
HPCS	high-pressure core spray
HPSI	high-pressure safety injection
HVAC	heating, ventilation, and air conditioning
IAEA	International Atomic Energy Agency
I&C	instrumentation and control
IASCC	irradiation assisted stress corrosion cracking
IC	isolation condenser
ID	inside diameter
IEB	inspection and enforcement bulletin
IEEE	Institute of Electrical and Electronics Engineers
IGA	intergranular attack
IGSCC	intergranular stress corrosion cracking
IMI	incore monitoring instrumentation
IN	information notice
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment

IR	insulation resistance
IRM	intermediate range monitor
IRS	Incident Reporting System
ISG	interim staff guidance
ISI	inservice inspection
LERs	licensee event reports
LG	lower grid
LOCA	loss of coolant accident
LP	low pressure
LPCI	low-pressure coolant injection
LPCS	low-pressure core spray
LPM	loose part monitoring
LPRM	low-power range monitor
LPSI	low-pressure safety injection
LRA	license renewal application
LR-ISG	License Renewal Interim Staff Guidance
LRT	leak rate test
LWR	light water reactor
MEAP	material/environment/aging effect/program
MIC	microbiologically influenced corrosion
MRP	Materials Reliability Program
MS	main steam
MSR	moisture separator/reheater
MT	magnetic particle testing
NDE	nondestructive examination
NEA	Nuclear Energy Agency
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NPAR	nuclear plant aging research
NPP	nuclear power plant
NPS	nominal pipe size
NRC	Nuclear Regulatory Commission
NRMS	normalized root mean square
NRR	Office of Nuclear Reactor Regulation
NSAC	Nuclear Safety Analysis Center
NSSS	nuclear steam supply system
NUMARC	Nuclear Management and Resources Council

OCCW	open-cycle cooling water
OD	outside diameter
ODSCC	outside diameter stress corrosion cracking
OECD	Organization for Economic Co-operation and Development
OE	operating experience
OM	operation and maintenance
PT	penetrant testing
PVC	polyvinyl chloride
PWR	pressurized water reactor
PWSCC	primary water stress corrosion cracking
QA	quality assurance
RCCA	rod control cluster assemblies
RCIC	reactor core isolation cooling
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RES	Office of Nuclear Regulatory Research
RG	Regulatory Guide
RHR	residual heat removal
RMS	root mean square
RWCU	reactor water cleanup
RWST	refueling water storage tank
RWT	refueling water tank
SAW	submerged arc weld
SBO	station blackout
SCs	structures and components
SCC	stress corrosion cracking
SDC	shutdown cooling
SFP	spent fuel pool
SG	steam generator
S/G	standards and guides
SIL	services information letter
SIT	safety injection tank
SLC	standby liquid control
SLR	subsequent license renewal
SLRAs	subsequent license renewal applications
SLRAAI	subsequent license renewal applicant action items
SOCs	Statement of Considerations

SOER	significant operating experience report
SRM	source range monitor
SRM	staff requirements memorandum
SRP-LR	Standard Review Plan for License Renewal
SRP-SLR	Standard Review Plan for Subsequent License Renewal
SS	stainless steel
SSCs	systems, structures, and components
TGSCC	transgranular stress corrosion cracking
TLAA	time-limited aging analysis
UCS	Union of Concerned Scientists
UHS	ultimate heat sink
USI	unresolved safety issue
UT	ultrasonic testing
UV	ultraviolet
XPLE	cross-linked polyethylene

INTRODUCTION

NUREG–2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," is referenced as a technical basis document in NUREG–2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants (SRP-SLR)." The Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report lists generic aging management reviews (AMRs) of systems, structures, and components (SSCs) that may be in the scope of subsequent license renewal applications (SLRAs) and identifies aging management programs (AMPs) that are determined to be acceptable to manage aging effects of SSCs in the scope of license renewal, as required by 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." If an applicant credits an AMP described in the GALL-SLR Report in the SLRA, the applicant should ensure that the conditions and operating experience (OE) at the plant are bounded by the conditions and OE for which the GALL-SLR Report program was evaluated. If these bounding conditions are not met, the applicant should address any additional aging effects and augment the AMPs for subsequent license renewal (SLR). If an SLRA references the GALL-SLR Report as the approach used to manage aging effect(s), the U.S. Nuclear Regulatory Commission (NRC) staff will use the GALL-SLR Report as a basis for the SLRA assessment consistent with guidance specified in the SRP-SLR.

BACKGROUND

The Atomic Energy Act (AEA) of 1954, as amended, allows the U.S. Nuclear Regulatory Commission (NRC) to issue licenses for commercial nuclear power reactors to operate for up to 40 years. The NRC regulations permit these licenses to be renewed beyond the initial 40-year term for an additional period of time, limited to 20-year increments per renewal, based on the outcome of an assessment to determine if the nuclear facility can continue to operate safely during the proposed period of extended operation. There are no limitations in the AEA or the NRC regulations restricting the number of times a license may be renewed.

The focus of license renewal, as described in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 54, is to identify aging effects that could impair the ability of systems, structures, and components (SSCs) within the scope of license renewal to perform their intended functions, and to demonstrate that these effects will be adequately managed during the period of extended operation. The regulatory requirements for both initial and subsequent license renewal (SLR) are established by 10 CFR Part 54. To address the unique aspects of material aging and degradation that would apply to SLR (e.g., to permit plants to operate to 80 years), the Office of Nuclear Reactor Regulation (NRR) requested support from the Office of Nuclear Regulatory Research (RES) to develop technical information to evaluate the feasibility of SLR. RES has memoranda of understanding with both the U.S. Department of Energy (DOE) and the Electric Power Research Institute (EPRI) to cooperate in nuclear safety research related to long-term operations beyond 60 years. Under these memoranda, the NRC and the DOE held two international conferences, in 2008 and 2011, on reactor operations beyond 60 years. In May 2012, the NRC and the DOE also co-sponsored the Third International Conference on Nuclear Power Plant Life Management for Long-Term Operations, organized by the International Atomic Energy Agency (IAEA). In February 2013, the Nuclear Energy Institute (NEI) held a forum on long-term operations and SLR. These conferences laid out the technical issues that would need to be addressed to provide assurance for safe operation beyond 60 years.

Based on the information gathered from these conferences and forums, and from other sources over the past several years, the most significant technical issues identified as challenging operation beyond 60 years are: reactor pressure vessel embrittlement; irradiation-assisted stress corrosion cracking (SCC) of reactor internals; concrete structures and containment degradation; and electrical cable environmental qualification (EQ), condition monitoring and assessment. Throughout this process, the NRC staff has emphasized that it is the industry’s responsibility to resolve these and other issues to provide the technical bases to ensure safe operation beyond 60 years.

The NRC, in cooperation with the DOE, completed the Expanded Materials Degradation Assessment (EMDA) in 2014 (ADAMS Accession Nos. ML14279A321, ML14279A331, ML14279A349, ML14279A430, and ML14279A461). The EMDA uses an expert elicitation process to identify materials and components which could be susceptible to significant degradation during operation beyond 60 years. The EMDA covers the reactor vessel, primary system piping, reactor vessel internals, concrete, and electrical cables and qualification. The NRC staff used the results of the EMDA to identify gaps in the current technical knowledge or issues not being addressed by planned industry or DOE research, and to identify AMPs that will require modification for SLR.

On May 9, 2012 (ADAMS Accession No. ML12158A545) and subsequently on November 1, 13, and 14, 2012, the NRC staff and interested stakeholders met to discuss issues and receive comments for consideration for SLR. In addition to working with external stakeholders, the NRC staff conducted aging management program (AMP) effectiveness audits at three units that were at least 2 years into the period of extended operation. The purpose of these audits was to better understand how licensees are implementing the license renewal AMPs, in terms of both the findings and the effectiveness of the programs, and to develop recommendations for updating license renewal guidance. The NRC staff used the information gathered from these audits to ensure that SLR guidance is fully informed by the licensee's aging management activities during the first license renewals. A summary of the first two AMP effectiveness audits can be found in the May 2013 report, "Summary of Aging Management Program Effectiveness Audits to Inform Subsequent License Renewal: R.E. Ginna NPP and Nine Mile Point Nuclear Station, Unit 1" (ADAMS Accession No. ML13122A007). The summary of the third audit can be found in the August 5, 2014, report, "H.B. Robinson Steam Electric Plant, Unit 2, Aging Management Program Effectiveness Audit" (ADAMS Accession No. ML14017A289).

The NRC staff reviewed domestic operating experience (OE) as reported in licensee event reports and NRC generic communications related to failures and degradation of passive components. Similarly the NRC staff reviewed the following international OE databases: (i) International Reporting System, jointly operated by the IAEA; (ii) IAEA's International Generic Ageing Lessons Learned Programme; (iii) Organization for Economic Co-operation and Development (OECD)/Nuclear Energy Agency (NEA) Component Operational Experience and Degradation and Ageing Programme database; and (iv) OECD/NEA Cable Aging Data and Knowledge database.

The NRC staff reviewed the results from AMP audits, findings from the EMDA, domestic and international OE, and public comments to identify technical issues that need to be considered for assuring the safe operation of NRC-licensed nuclear power plant (NPPs). By letter dated August 6, 2014 (ADAMS Accession No. ML14253A104), NEI documented the industry's views and recommendations for updating NUREG–1801 Revision 2, "Generic Aging Lessons Learned (GALL) Report," and NUREG–1800 Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," to support SLR. Between fiscal years 2014 and 2015, the NRC staff reviewed the comments and recommendations and drafted the GALL-SLR Report to ensure that sufficient guidance was in place to support review of an SLR application in 2018 or 2019.

The staff requirements memorandum (SRM) on SECY-14-0016 "Ongoing Staff Activities to Assess Regulatory Considerations for Power Reactor Subsequent License Renewal" (ADAMS Accession No. ML14241A578) directed the staff to continue to update the license renewal guidance, as needed, to provide additional clarity on the implementation of the license renewal regulatory framework. The SRM also directed the staff to keep the Commission informed on the progress in resolving the following technical issues related to SLR: (i) reactor pressure vessel neutron embrittlement at high fluence, (ii) irradiation assisted SCC of reactor internals and primary system components, (iii) concrete and containment degradation, and (iv) electrical cable qualification and condition assessment. In addition, the SRM directed that the staff should keep the Commission informed regarding the staff's readiness for accepting an application and any further need for regulatory process changes, rulemaking, or research.

The GALL-SLR report also includes the NRC staff's resolutions of License Renewal Interim Staff Guidances (LR-ISGs) from 2011 through 2015. Under the LR-ISG process, the NRC staff, industry, or stakeholders can propose a change to certain license renewal guidance documents. The NRC staff evaluates the issue, develops the proposed LR-ISG, issues it for public comment, evaluates any comments received, and, if necessary, issues the final LR-ISG.

The LR-ISG is then used until the NRC staff incorporates the revised guidance into a formal license renewal guidance document revision. The LR-ISGs addressed in the GALL-SLR report are:

- LR-ISG-2011-01: Aging Management of Stainless Steel Structures and Components in Treated Borated Water, Revision 1
- LR-ISG-2011-02: Aging Management Program for Steam Generators
- LR-ISG-2011-03: Generic Aging Lessons Learned (GALL) Report Revision 2 AMP XI.M41, "Buried and Underground Piping and Tanks"
- LR-ISG-2011-04: Updated Aging Management Criteria for Reactor Vessel Internal Components of Pressurized Water Reactors
- LR-ISG-2011-05: Ongoing Review of Operating Experience
- LR-ISG-2012-01: Wall Thinning Due to Erosion Mechanisms
- LR-ISG-2012-02: Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation
- LR-ISG-2013-01: Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks
- LR-ISG-2015-01: Changes to Buried and Underground Piping and Tank Recommendations

OVERVIEW OF THE GENERIC AGING LESSONS LEARNED FOR SUBSEQUENT LICENSE RENEWAL REPORT EVALUATION PROCESS

The Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report contains 11 chapters and two appendices. The majority of the chapters contain summary descriptions and tabulations of evaluations of aging management programs (AMPs) for a large number of structures and components (SCs) in major plant systems found in light-water reactor nuclear power plants (NPPs). The major plant systems include the containment structures (Chapter II), structures and component supports (Chapter III), reactor vessel, internals and reactor coolant system (Chapter IV), engineered safety features (Chapter V), electrical components (Chapter VI), auxiliary systems (Chapter VII), and steam and power conversion system (Chapter VIII).

Chapter I of the GALL-SLR Report addresses the application of the American Society of Mechanical Engineers (ASME) code for subsequent license renewal (SLR). Chapter IX contains definitions of a selection of standard terms used within the GALL-SLR Report. Chapter X contains examples of AMPs that may be used to demonstrate the acceptance of time-limited aging analysis (TLAAs) in accordance with 10 CFR 54.21(c)(1)(iii). Chapter XI contains the AMPs for the mechanical, structural and electrical components. The appendices of the GALL-SLR Report addresses quality assurance for AMPs and operating experience (OE).

The evaluation process for the AMPs and the application of the GALL-SLR Report is described in this document. The aging management review (AMR) items for the GALL-SLR Report are presented in tabular format as described in Table 1. Table 1 describes the information presented in each column of the tables in Chapters II through VIII contained in this report.

The staff's evaluation of the adequacy of each generic AMP to manage certain aging effects for particular SCs is based on its review of the following 10 program elements in each AMP, as defined in Table 2.

On the basis of its evaluation, if the staff determines that a program is adequate to manage certain aging effects for a particular SC without change, the "Further Evaluation" entry will indicate that no further evaluation is recommended for SLR.

Chapters X and XI of the GALL-SLR Report contain generic AMPs that the staff finds to be sufficient to manage aging effects in the subsequent period of extended operation, such as the ASME Section XI inservice inspection, water chemistry, or structures monitoring program.

Table 1. Aging Management Review Column Heading Descriptions	
Column Heading	**Description**
New (N), Modified (M), Deleted (D) Item	Identifies the item as new to GALL-SLR Report, modified from GALL Revision 2, deleted from GALL Revision 2, or if blank, is unchanged from GALL Revision 2. The NRC will publish the technical bases for these new, modified, and deleted AMR items in a NUREG containing the disposition of public comments and the technical bases for changes in the guidance documents when the final SLR guidance documents are published.
Item	Identifies a unique number for the item (i.e., VII.G.A-91). The first part of the number indicates the chapter and AMR system (e.g., VII.G is in the auxiliary systems, fire protection system), and the second part is a unique chapter-specific identifier within a chapter (e.g., A–91 for auxiliary systems).
SRP Item (Table, ID)	For each row in the subsystem tables, this item identifies the corresponding row identifier from the SRP-SLR to provide the crosswalk to the SRP system table items.
Structure and/or Component	Identifies the structure or components to which the row applies.
Material	Identifies the material of construction. See Chapter IX.C of this report for further information.
Environment	Identifies the environment applicable to this row. See Chapter IX.D of this report for further information.
Aging Effect/ Mechanism	Identifies the applicable aging effect and mechanism(s). See Chapters IX.E and IX.F of this report for more information on applicable aging effects/mechanisms.
Aging Management Program (AMP)/TLAA	Identifies an AMP/TLAA found acceptable for adequately managing the effects of aging. See Chapters X and XI of this report.
Further Evaluation	Identifies whether a further evaluation is needed.

Table 2. Aging Management Programs Element Descriptions	
AMP Element	**Description**
1. Scope of the Program	The scope of the program should include the specific structures and components subject to an AMR.
2. Preventive Actions	Preventive actions should mitigate or prevent the applicable aging effects.
3. Parameters Monitored or Inspected	This identifies the aging effects that the program manages and provides a link between the parameter or parameters that will be monitored and how the monitoring of these parameters will ensure adequate aging management.
4. Detection of Aging Effects	Detection of aging effects should occur before there is a loss of any structure and component intended function. This element describes aspects such as method or technique (i.e., visual, volumetric, surface inspection), frequency, sample size, data collection, and timing of new/one-time inspections to ensure timely detection of aging effects.
5. Monitoring and Trending	Monitoring and trending should provide for an estimate of the extent of the effects of aging and timely corrective or mitigative actions.
6. Acceptance Criteria	Acceptance criteria, against which the need for corrective action will be evaluated, should ensure that the particular structure and component's intended functions are maintained under all current licensing basis conditions during the subsequent period of extended operation.
7. Corrective Actions	Description of corrective actions that will be implemented if the acceptance criteria of the program are not met.
8. Confirmation Process	The confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective.
9. Administrative Controls	Administrative controls should provide a formal review and approval process.
10. Operating Experience	Operating experience applicable to the AMP, including past corrective actions resulting in program enhancements or additional programs, should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure- and component intended function(s) will be maintained during the subsequent period of extended operation. In addition, an ongoing review of both plant-specific and industry OE ensures that the AMP is effective in managing the aging effects for which it is credited. The AMP is either enhanced or new AMPs are developed, as appropriate, when it is determined through the evaluation of OE that the effects of aging may not be adequately managed.

APPLICATION OF THE GENERIC AGING LESSONS LEARNED FOR SUBSEQUENT LICENSE RENEWAL REPORT

The Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report is a technical basis document to the Standard Review Plan for Subsequent License Renewal (SRP-SLR), which provides the staff with guidance in reviewing a subsequent license renewal application (SLRA). The GALL-SLR Report should be treated in the same manner as an approved topical report that is generically applicable. An applicant may reference the GALL-SLR Report in a SLRA to demonstrate that the aging management programs (AMPs) at the applicant's facility correspond to those reviewed and approved in the GALL-SLR Report.

If an applicant takes credit for an AMP in GALL-SLR Report, it is incumbent on the applicant to ensure that the plant AMP contains all the elements of the referenced GALL-SLR program. In addition, the conditions and operating experience (OE) at the plant must be bounded by the conditions and OE for which the GALL-SLR Report AMP was evaluated, otherwise it is incumbent on the applicant to augment the GALL-SLR Report AMP as appropriate to address the impact of the plant-specific OE on the AMP element criteria. The documentation for the above verifications must be available on-site in an auditable form.

The GALL-SLR Report contains one acceptable way to manage aging effects for SLR. An applicant may propose alternatives for staff review in its plant-specific SLRA. The use of the GALL-SLR Report is not required, but its use should facilitate both preparation of an SLRA by an applicant and timely, consistent review by the U.S. Nuclear Regulatory Commission (NRC) staff.

The GALL-SLR Report does not address scoping of structures and components (SCs) for license renewal; this is addressed in SRP-SLR Chapter 2. Scoping is plant-specific, and the results depend on the plant design and current licensing basis. The inclusion of a certain structure or component in the GALL-SLR Report does not imply that this particular structure or component is within the scope of license renewal for all plants. Conversely, the omission of a certain structure or component in the GALL-SLR Report does not imply that this particular structure or component is not within the scope of SLR for any plants.

The GALL-SLR Report contains an evaluation of a large number of SCs that may be in the scope of a typical SLRA. The evaluation results documented in the GALL-SLR Report indicate that many existing, typical generic AMPs are adequate to manage aging effects for particular structures or components for SLR without change. The GALL-SLR Report also contains recommendations on specific areas for which existing generic AMPs should be augmented (require further evaluation) for SLR and documents the technical basis for each such determination. The GALL-SLR Report identifies certain systems, structures, and components (SSCs) that may or may not be subject to particular aging effects, and those for which industry is developing generic AMPs or investigating whether aging management is warranted.

Appendix A of the GALL-SLR Report addresses quality assurance (QA) for AMPs. Those aspects of the aging management review (AMR) process that affect the quality of safety-related SSCs are subject to the QA requirements of Appendix B to 10 CFR Part 50. For nonsafety-related-SCs subject to an AMR, the existing 10 CFR Part 50, Appendix B, QA program may be used by an applicant to address the elements of the corrective actions, confirmation process, and administrative controls for an AMP for subsequent license renewal (SLR).

The GALL-SLR Report provides a technical basis for crediting existing plant AMPs and recommending areas for AMP augmentation and further evaluation. The incorporation of the GALL-SLR Report information into the SRP-SLR, as directed by the Commission, should improve the efficiency of the SLR review process and the use of staff resources.

CHAPTER I

APPLICATION OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS CODE

APPLICATION OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS CODE

The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Division 1, Sections III (design) and XI (inservice inspection requirements) were developed and are revised periodically by industry code committees composed of representatives of utilities, reactor designers, architect-engineers, component manufacturers, insurance companies, the U.S. Nuclear Regulatory Commission (NRC), and others. In 1971, the Atomic Energy Commission (AEC), the predecessor of the NRC, incorporated the ASME B&PV Code into the regulations in 10 CFR 50.55a through issuance of the Federal Register Notice (FRN) for the final rule {36 FR 11423 [June 12, 1971]}.

The statement of consideration (SOC) for the initial issuance of 10 CFR 50.55a provides the bases for AEC's endorsement and use of the ASME Code:

> It has been generally recognized that, for boiling and pressurized water-cooled reactors, pressure vessels, piping, pumps, and valves which are part of the reactor coolant pressure boundary should, as a minimum, be designed, fabricated, inspected, and tested in accordance with the requirements of the applicable American Society of Mechanical Engineers (ASME) codes in effect at the time the equipment is purchased[.]
>
> Because of the safety significance of uniform early compliance by the nuclear industry with the requirements of these ASME codes and published code revisions, the Commission has adopted the following amendments to Part 50 and 115, which require that certain components and systems of water-cooled reactors important to safety comply with these codes and appropriate revisions to the codes at the earliest feasible time.
>
> Compliance with the provisions of the amendments and the referenced codes is intended to insure a basic, sound quality level.

These ASME Code sections are based on the collective engineering judgment of the code committees and document the conditions that must be monitored, the inspection techniques to identify those conditions, the frequency of the inspections, and the acceptance criteria that the inspection results must meet in order to assure the integrity of the structures and components considered in the code. The NRC has accepted this engineering judgment by endorsing the use of selected sections of the ASME Code, as incorporated in 10 CFR 50.55a.

In addition, the NRC periodically amends 10 CFR 50.55a and issues FRNs about this rule in order to endorse, by reference, newer editions and ASME Code addenda subject to the modifications and limitations identified in 10 CFR 50.55a. As stated in 65 FR 53050 (August 31, 2000):

> To ensure that the GALL report conclusions will remain valid when future editions of the ASME Code are incorporated into the NRC regulations by the 10 CFR 50.55a rulemaking, the staff will perform an evaluation of these later editions for their adequacy for license renewal using the 10-element program evaluation described in the GALL Report as part of the 10 CFR 50.55a rulemaking.

The staff will continue to evaluate future editions of the ASME Code for their adequacy for subsequent license renewal (SLR), and will document this evaluation in the SOC accompanying future 10 CFR 50.55a amendments, which will be published in a FRN.

References to American Society of Mechanical Engineers Code Section XI Used in This Report

To aid applicants in the development of their subsequent license renewal applications (SLRAs), the staff has developed a list of aging management programs (AMPs) in the Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report that are based on conformance with the 10-program element criteria defined in Section A.1.2.3 of the Subsequent License Renewal (SRP-SLR). Some of the AMPs referenced in the GALL-SLR Report are based entirely or in part on compliance with the requirements of ASME Code Section XI, as endorsed for use through reference in 10 CFR 50.55a. In addition, in some cases, the staff has determined that specific requirements in ASME Code Section XI need to be augmented to ensure adequate aging management consistent with the requirements of the license renewal rule. Thus, some of the AMPs in the GALL-SLR Report also provide guidance on augmenting the requirements of ASME Code Section XI. The staff has determined that the ASME Code Section XI requirements referenced in Table I-1 provide an acceptable basis for managing the effects of aging during the subsequent period of extended operation, except where noted and augmented in the GALL-SLR Report. Therefore, except where noted and augmented in the GALL-SLR Report, the ASME Code Section XI editions and addenda listed in Table I-1, subject to the modifications and limitations in 10 CFR 50.55a, should be treated as consistent with the GALL-SLR Report, and an applicant need not identify exceptions when using these specific editions and addenda.

An applicant should identify exceptions to the GALL-SLR Report and provide justification when using any ASME Section XI edition or addenda not listed in Table I-1. With respect to more recent ASME Section XI editions and addenda, the NRC will update Table I-1 through either a published revision to the GALL-SLR Report or through the license renewal interim staff guidance process after the staff has evaluated the specific ASME Section XI edition or addendum and determined the extent to which it is adequate for license renewal.

Updates to the American Society of Mechanical Engineers Code of Record During U.S. Nuclear Regulatory Commission’s Review of Subsequent License Renewal Applications

Pursuant to 10 CFR 50.55a(g)(4), a nuclear licensee is required to amend its current licensing basis (CLB) by updating its ASME Code Section XI edition and addenda of record to the most recently endorsed edition and addenda referenced in 10 CFR 50.55a one year prior to entering the next 10-year inservice inspection interval for its unit. Pursuant to 10 CFR 54.21(b), an applicant for license renewal is required to periodically submit updates of its SLRA to identify any changes in its CLB that materially affect the contents of the SLRA. The rule requires an update of the SLRA each year following the submittal of the application and an additional update 3 months prior to the completion of the NRC’s review of the SLRA. If an applicant’s ASME Code Section XI edition of record is updated under the requirements of 10 CFR 50.55a(g)(4) during the NRC’s review of the SLRA, the applicant should update those AMPs in the SLRA that are impacted by this change in the CLB when the applicant submits the next update of the SLRA required by 10 CFR 54.21(b).

Effective Period for Approved Relief Requests and Code Cases

The current regulatory process, including 10 CFR 50.55a, continues into the subsequent period of extended operation. The NRC Director of the Office of Nuclear Reactor Regulation may authorize a licensee-proposed alternative to ASME Section XI if it is submitted as an alternative in accordance with 10 CFR 50.55a(a)(3). The staff's authorization of an alternative program typically does not extend beyond the current 10-year interval for which the alternative was proposed. For cases in which this interval extends beyond the renewed license period into the subsequent period of extended operation, the approved alternative remains in effect until the end of that interval, consistent with the specific approval (60 FR 22461, 22483).

Pursuant to 10 CFR 50.55a(b)(5), licensees may apply ASME Code cases listed in NRC Regulatory Guide (RG) 1.147, through the most recent endorsed revision, without NRC authorization, subject to the limitations contained in the rule. The rule permits licensees to continue to apply the Code case, or a most recent version that is incorporated by the RG, until the end of the 10-year interval. For cases in which this interval extends beyond the renewed license period into the subsequent renewed license period, the Code case, or a more recent endorsed version, remains in effect until the end of that interval, consistent with 10 CFR 50.55a(b)(5) and the statements of consideration for the final license renewal rule 60 FR 22461.

Table I-1. ASME Section XI Editions and Addenda that Are Acceptable for Use in AMPs

Acceptable Editions and Addenda	Basis	Conditions or Limitations for License Renewal
1995 Edition 1996 Addenda 1997 Addenda 1998 Edition 1999 Addenda 2000 Addenda	67 FR 60520 (September 26, 2002)	None beyond what is specified in 10 CFR 50.55a
2001 Edition 2002 Addenda 2003 Addenda	69 FR 58804 (October 1, 2004)	None beyond what is specified in 10 CFR 50.55a
2004 Edition	73 FR 52730 (September 10, 2008)	None beyond what is specified in 10 CFR 50.55a
2005 Addenda 2006 Addenda 2007 Edition 2008 Addenda	76 FR 36266 (June 21, 2011)	None beyond what is specified in 10 CFR 50.55a

CHAPTER II

CONTAINMENT STRUCTURES

II CONTAINMENT STRUCTURES

A. PRESSURIZED WATER REACTOR CONTAINMENTS

B. BOILING WATER REACTOR CONTAINMENTS

II PRESSURIZED WATER REACTOR CONTAINMENTS

A1. CONCRETE CONTAINMENTS (REINFORCED AND PRESTRESSED)

A2. STEEL CONTAINMENTS

A3. COMMON COMPONENTS

A1. CONCRETE CONTAINMENTS (REINFORCED AND PRESTRESSED)

Systems, Structures, and Components

This section addresses the elements of pressurized water reactor (PWR) concrete containment structures. Concrete containment structures are divided into three elements: (i) concrete, (ii) steel, and (iii) prestressing systems.

System Interfaces

Functional interfaces include the primary containment heating and ventilation system (VII.F3), containment isolation components (V.C), and the containment spray system (V.A). Physical interfaces exist with any structure, system, or component that either penetrates the containment wall, such as the main steam (MS) system (VIII.B1) and the feedwater (FW) system (VIII.D1), or is supported by the containment structure, such as cranes (VII.B). The containment structure basemat typically provides support to the nuclear steam supply system components and containment internal structures.

II CONTAINMENT STRUCTURES
Table A1 Concrete Containments (Reinforced and Prestressed)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	II.A1.CP-87	3.5-1, 16	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.A1.CP-31	3.5-1, 18	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.A1.CP-33	3.5-1, 19	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.A1.CP-32	3.5-1, 20	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
M	II.A1.CP-68	3.5-1, 21	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL"	No

II Table A1 — CONTAINMENT STRUCTURES
Concrete Containments (Reinforced and Prestressed)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			steel					
	II.A1.CP-100	3.5-1, 24	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Air – indoor uncontrolled, air – outdoor, ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
M	II.A1.CP-147	3.5-1, 11	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Air – outdoor, ground water/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program	Yes
M	II.A1.CP-67	3.5-1, 12	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes
M	II.A1.CP-102	3.5-1, 14	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes

II CONTAINMENT STRUCTURES
Table A1 Concrete Containments (Reinforced and Prestressed)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.A1.CP-97	3.5-1, 23	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing steel	Concrete	Any environment	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
M	II.A1.CP-34	3.5-1, 3	Concrete: dome; wall; basemat; ring girders; buttresses	Concrete	Air – indoor uncontrolled, air – outdoor	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program	Yes
M	II.A1.CP-101	3.5-1, 1	Concrete: dome; wall; basemat; ring girders; buttresses	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	Yes
M	II.A1.C-07	3.5-1, 2	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes

II — CONTAINMENT STRUCTURES
Table A1 — Concrete Containments (Reinforced and Prestressed)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.A1.C-11	3.5-1, 8	Prestressing system: tendons	Steel	Air – indoor uncontrolled, air – outdoor	Loss of prestress due to relaxation; shrinkage; creep; elevated temperature	TLAA, SRP-SLR Section 4.5, "Concrete Containment Tendon Prestress"	Yes
	II.A1.C-10	3.5-1, 32	Prestressing system: tendons; anchorage components	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.A1.CP-35	3.5-1, 35	Steel elements (accessible areas): liner; liner anchors; integral attachments	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.A1.CP-98	3.5-1, 5	Steel elements (inaccessible areas): liner; liner anchors; integral attachments	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE" and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes

A2. STEEL CONTAINMENTS

Systems, Structures, and Components

This section addresses the elements of pressurized water reactor (PWR) steel containment structures. Steel containment structures are divided into two elements: (i) steel and (ii) concrete.

System Interfaces

Functional interfaces include the primary containment heating and ventilation system (VII.F3), containment isolation components (V.C), and the containment spray system (V.A). Physical interfaces exist with any structure, system, or component that either penetrates the containment wall, such as the main steam (MS) system (VIII.B1) and the feedwater (FW) system (VIII.D1), or is supported by the containment structure, such as cranes (VII.B). The containment structure basemat typically provides support to the nuclear steam supply system components and containment internal structures.

II CONTAINMENT STRUCTURES
Table A2 Steel Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	II.A2.CP-51	3.5-1, 18	Concrete (accessible areas): basemat	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
	II.A2.CP-58	3.5-1, 19	Concrete (accessible areas): basemat	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
	II.A2.CP-72	3.5-1, 16	Concrete (accessible areas): basemat	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
	II.A2.CP-155	3.5-1, 20	Concrete (accessible areas): basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
M	II.A2.CP-74	3.5-1, 21	Concrete (accessible areas): basemat; reinforcing	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP	No

II CONTAINMENT STRUCTURES
Table A2 Steel Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			steel			embedded steel	XI.S6, "Structures Monitoring"	
M	II.A2.CP-70	3.5-1, 11	Concrete (inaccessible areas): basemat	Concrete	Air – outdoor, ground water/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program	Yes
M	II.A2.CP-104	3.5-1, 12	Concrete (inaccessible areas): basemat	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes
	II.A2.CP-71	3.5-1, 24	Concrete (inaccessible areas): basemat	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
M	II.A2.CP-53	3.5-1, 14	Concrete (inaccessible areas): basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes
M	II.A2.CP-75	3.5-1, 23	Concrete (inaccessible areas): basemat; reinforcing steel	Concrete	Any environment	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No

II CONTAINMENT STRUCTURES
Table A2 Steel Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.A2.CP-69	3.5-1, 1	Concrete: basemat	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	Yes
M	II.A2.C-07	3.5-1, 2	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	II.A2.CP-35	3.5-1, 35	Steel elements (accessible areas): liner; liner anchors; integral attachments	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.A2.CP-98	3.5-1, 5	Steel elements (inaccessible areas): liner; liner anchors; integral attachments	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE" and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes

A3. COMMON COMPONENTS

Systems, Structures, and Components

This section addresses the common components of pressurized water reactor (PWR) containment structures. The common components include (i) penetration sleeves and bellows, (ii) dissimilar metal welds, (iii) personnel airlock, (iv) equipment hatch, (v) seals, (vi) gaskets, and (vii) moisture barriers.

System Interfaces

Functional interfaces include the primary containment heating and ventilation system (VII.F3), containment isolation components (V.C), and the containment spray system (V.A). Physical interfaces exist with any structure, system, or component that either penetrates the containment wall, such as the main steam (MS) system (VIII.B1) and the feedwater (FW) system (VIII.D1), or is supported by the containment structure, such as cranes (VII.B). The containment structure basemat typically provides support to the nuclear steam supply system components and containment internal structures.

II CONTAINMENT STRUCTURES
Table A3 Common Components

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	II.A3.CP-40	3.5-1, 26	Moisture barriers (caulking, flashing, other sealants)	Elastomer, rubber and other similar materials	Air – indoor uncontrolled	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
	II.A3.CP-36	3.5-1, 35	Penetration sleeves	Steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.A3.CP-38	3.5-1, 10	Penetration sleeves; penetration bellows	Stainless steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.A3.CP-37	3.5-1, 27	penetration sleeves; penetration bellows	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.A3.C-16	3.5-1, 28	Personnel airlock, equipment hatch, CRD	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection	No

II CONTAINMENT STRUCTURES
Table A3 Common Components

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			hatch				IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	
M	II.A3.C-13	3.5-1, 9	Personnel airlock, equipment hatch, CRD hatch, penetration sleeves; penetration bellows	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis"	Yes
M	II.A3.CP-39	3.5-1, 29	Personnel airlock, equipment hatch, CRD hatch: locks, hinges, closure mechanisms	Steel	Air – indoor uncontrolled, air – outdoor	Loss of leak tightness due to mechanical wear	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.A3.CP-150	3.5-1, 30	Pressure-retaining bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.A3.CP-148	3.5-1, 31	Pressure-retaining bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	No

II CONTAINMENT STRUCTURES
Table A3 Common Components

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	II.A3.CP-41	3.5-1, 33	Seals and gaskets	Elastomer, rubber and other similar materials	Air – indoor uncontrolled, air – outdoor	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.A3.CP-152	3.5-1, 34	Service Level I coatings	Coatings	Air – indoor uncontrolled	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage	AMP XI.S8, "Protective Coating Monitoring and Maintenance"	No

II BOILING WATER REACTOR CONTAINMENTS

B1. MARK I CONTAINMENTS

B2. MARK II CONTAINMENTS

B3. MARK III CONTAINMENTS

B4. COMMON COMPONENTS

B1 MARK I CONTAINMENTS

Systems, Structures, and Components

This section addresses the elements of boiling water reactor (BWR) Mark I containment structures. Steel containments are discussed in II.B1.1 and concrete containments are discussed in II.B1.2.

System Interfaces

Functional interfaces include the primary containment heating and ventilation system (VII.F3), containment isolation components (V.C), and the standby gas treatment system (V.B). Physical interfaces exist with any structure, system, or component that either penetrates the containment wall, such as the main steam (MS) system (VIII.B2) and the feedwater (FW) system (VIII.D2), or is supported by the containment structure. The containment structure basemat may provide support to the nuclear steam supply system components and containment internal structures.

II CONTAINMENT STRUCTURES
Table B1.1 Mark I Steel Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	II.B1.1.CP-43	3.5-1, 35	Steel elements (accessible areas): drywell shell; drywell head; drywell shell in sand pocket regions;	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.B1.1.C-23	3.5-1, 36	Steel elements: drywell head; downcomers	Steel	Air – indoor uncontrolled	Loss of material due to mechanical wear, including fretting	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
	II.B1.1.CP-44	3.5-1, 41	Steel elements: drywell support skirt	Steel	Concrete	None	None	No
M	II.B1.1.CP-109	3.5-1, 7	Steel elements: torus ring girders; downcomers;	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	Yes
M	II.B1.1.CP-48	3.5-1, 6	Steel elements: torus shell	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B1.1.CP-49	3.5-1, 27	Steel elements: torus; vent line; vent	Steel; stainless steel	Air – indoor uncontrolled	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection	No

II CONTAINMENT STRUCTURES
Table B1.1 Mark I Steel Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			header; vent line bellows; downcomers				IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	
M	II.B1.1.C-21	3.5-1, 9	Steel elements: torus; vent line; vent header; vent line bellows; downcomers	Steel; stainless steel	Air – indoor uncontrolled	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis"	Yes
	II.B1.1.CP-50	3.5-1, 39	Steel elements: vent line bellows	Stainless steel	Air – indoor uncontrolled	Cracking due to stress corrosion cracking	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No

II CONTAINMENT STRUCTURES
Table B1.2 Mark I Concrete Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.B1.2.CP-79	3.5-1, 21	Concrete (accessible areas): basemat; reinforcing steel	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.B1.2.CP-59	3.5-1, 19	Concrete (accessible areas): containment; wall; basemat	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.B1.2.CP-54	3.5-1, 20	Concrete (accessible areas): containment; wall; basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
M	II.B1.2.CP-80	3.5-1, 23	Concrete (inaccessible areas): basemat; reinforcing steel	Concrete	Any environment	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, “ASME Section XI, Subsection IWL” and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
M	II.B1.2.CP-99	3.5-1, 12	Concrete (inaccessible areas): containment; wall; basemat	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes
M	II.B1.2.CP-110	3.5-1, 14	Concrete (inaccessible areas): containment;	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to	Plant-specific aging management program	Yes

II CONTAINMENT STRUCTURES
Table B1.2 Mark I Concrete Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			wall; basemat			leaching of calcium hydroxide and carbonation		
M	II.B1.2.CP-105	3.5-1, 1	Concrete elements: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	Yes
M	II.B1.2.CP-57	3.5-1, 3	Concrete: containment; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program	Yes
M	II.B1.2.CP-106	3.5-1, 16	Concrete: containment; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor, ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
M	II.B1.2.C-07	3.5-1, 2	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes

II CONTAINMENT STRUCTURES
Table B1.2 Mark I Concrete Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	II.B1.2.CP-46	3.5-1, 35	Steel elements (accessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.B1.2.CP-114	3.5-1, 41	Steel elements (inaccessible areas): support skirt	Steel	Concrete	None	None	No
M	II.B1.2.CP-63	3.5-1, 5	Steel elements (inaccessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE" and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B1.2.CP-117	3.5-1, 31	Steel elements: downcomer pipes	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection	No

II CONTAINMENT STRUCTURES
Table B1.2 Mark I Concrete Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							IWE"	
M	II.B1.2.C-23	3.5-1, 36	Steel elements: drywell head; downcomers	Steel	Air – indoor uncontrolled	Loss of material due to mechanical wear, including fretting	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
	II.B1.2.C-49	3.5-1, 37	Steel elements: suppression chamber (torus) liner (interior surface)	Steel; stainless steel	Air – indoor uncontrolled, treated water	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No

B2 MARK II CONTAINMENTS

Systems, Structures, and Components

This section addresses the elements of boiling water reactor (BWR) Mark II containment structures. Mark II steel containments are discussed in II.B2.1. Mark II concrete containments are discussed in II.B2.2.

System Interfaces

Functional interfaces include the primary containment heating and ventilation system (VII.F3), containment isolation components (V.C), and the standby gas treatment system (V.B). Physical interfaces exist with any structure, system, or component that either penetrates the containment wall, such as the main steam (MS) system (VIII.B2) and the feedwater (FW) system (VIII.D2), or is supported by the containment structure. The containment structure basemat may provide support to the nuclear steam supply system components and containment internal structures.

II CONTAINMENT STRUCTURES
Table B2.1 Mark II Steel Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	II.B2.1.CP-46	3.5-1, 35	Steel elements (accessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.B2.1.CP-114	3.5-1, 41	Steel elements (inaccessible areas): support skirt	Steel	Concrete	None	None	No
M	II.B2.1.CP-63	3.5-1, 5	Steel elements (inaccessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE" and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B2.1.CP-117	3.5-1, 31	Steel elements: downcomer pipes	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection	No

II CONTAINMENT STRUCTURES
Table B2.1 Mark II Steel Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							IWE"	
M	II.B2.1.C-23	3.5-1, 36	Steel elements: drywell head; downcomers	Steel	Air – indoor uncontrolled	Loss of material due to mechanical wear, including fretting	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
	II.B2.1.CP-107	3.5-1, 27	Suppression pool shell	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, treated water	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.B2.1.C-45	3.5-1, 9	Suppression pool shell; unbraced downcomers	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, treated water	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis"	Yes
	II.B2.1.CP-142	3.5-1, 40	Unbraced downcomers	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, treated water	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection IWE"	No

II CONTAINMENT STRUCTURES
Table B2.2 Mark II Concrete Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.B2.2.CP-79	3.5-1, 21	Concrete (accessible areas): basemat; reinforcing steel	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.B2.2.CP-59	3.5-1, 19	Concrete (accessible areas): containment; wall; basemat	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.B2.2.CP-54	3.5-1, 20	Concrete (accessible areas): containment; wall; basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
M	II.B2.2.CP-80	3.5-1, 23	Concrete (inaccessible areas): basemat; reinforcing steel	Concrete	Any environment	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, “ASME Section XI, Subsection IWL” and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
M	II.B2.2.CP-99	3.5-1, 12	Concrete (inaccessible areas): containment; wall; basemat	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes
M	II.B2.2.CP-110	3.5-1, 14	Concrete (inaccessible areas): containment;	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to	Plant-specific aging management program	Yes

II CONTAINMENT STRUCTURES
Table B2.2 Mark II Concrete Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			wall; basemat			leaching of calcium hydroxide and carbonation		
M	II.B2.2.CP-105	3.5-1, 1	Concrete elements: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	Yes
M	II.B2.2.CP-57	3.5-1, 3	Concrete: containment; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program	Yes
M	II.B2.2.CP-106	3.5-1, 16	Concrete: containment; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor, ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
M	II.B2.2.C-07	3.5-1, 2	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and	AMP XI.S6, "Structures Monitoring"	Yes

II CONTAINMENT STRUCTURES
Table B2.2 Mark II Concrete Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						erosion of porous concrete subfoundation		
M	II.B2.2.C-11	3.5-1, 8	Prestressing system: tendons	Steel	Air – indoor uncontrolled, air – outdoor	Loss of prestress due to relaxation; shrinkage; creep; elevated temperature	TLAA, SRP-SLR Section 4.5, "Concrete Containment Tendon Prestress"	Yes
	II.B2.2.C-10	3.5-1, 32	Prestressing system: tendons; anchorage components	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.B2.2.CP-46	3.5-1, 35	Steel elements (accessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.B2.2.CP-114	3.5-1, 41	Steel elements (inaccessible areas): support skirt	Steel	Concrete	None	None	No

II CONTAINMENT STRUCTURES
Table B2.2 Mark II Concrete Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.B2.2.CP-63	3.5-1, 5	Steel elements (inaccessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE" and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B2.2.CP-117	3.5-1, 31	Steel elements: downcomer pipes	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
M	II.B2.2.C-23	3.5-1, 36	Steel elements: drywell head; downcomers	Steel	Air – indoor uncontrolled	Loss of material due to mechanical wear, including fretting	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
	II.B2.2.C-49	3.5-1, 37	Steel elements: suppression chamber (torus) liner (interior surface)	Steel; stainless steel	Air – indoor uncontrolled, treated water	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.B2.2.CP-64	3.5-1, 40	Steel elements: vent header; downcomers	Steel; stainless steel	Air – indoor uncontrolled, treated water	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection	No

II CONTAINMENT STRUCTURES
Table B2.2 Mark II Concrete Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							IWE"	
M	II.B2.2.C-48	3.5-1, 9	Steel elements: vent header; downcomers	Steel; stainless steel	Air – indoor uncontrolled, treated water	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis"	Yes

II MARK III CONTAINMENTS

B3.1 STEEL CONTAINMENTS

B3.2 CONCRETE CONTAINMENTS

B.3 MARK III CONTAINMENTS

Systems, Structures, and Components

This section addresses the elements of boiling water reactor (BWR) Mark III containment structures. Mark III steel containments are discussed in II.B3.1. Mark III concrete containments are discussed in II.B3.2.

System Interfaces

Functional interfaces include the primary containment heating and ventilation system (VII.F3), containment isolation components (V.C), and the standby gas treatment system (V.B). Physical interfaces exist with any structure, system, or component that either penetrates the containment wall, such as the main steam (MS) system (VIII.B2) and the feedwater (FW) system (VIII.D2), or is supported by the containment structure. The containment structure basemat may provide support to the nuclear steam supply system components and containment internal structures.

II CONTAINMENT STRUCTURES
Table B3.1 Mark III Steel Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	II.B3.1.CP-72	3.5-1, 16	Concrete (accessible areas): basemat	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
	II.B3.1.CP-156	3.5-1, 20	Concrete (accessible areas): basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, “Structures Monitoring”	No
	II.B3.1.CP-66	3.5-1, 19	Concrete (accessible areas): basemat, concrete fill-in annulus	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, “Structures Monitoring”	No
M	II.B3.1.CP-74	3.5-1, 21	Concrete (accessible areas): basemat; reinforcing steel	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, “Structures Monitoring”	No
	II.B3.1.CP-71	3.5-1, 24	Concrete (inaccessible areas): basemat	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling,	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP	No

II CONTAINMENT STRUCTURES
Table B3.1 Mark III Steel Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						scaling) due to aggressive chemical attack	XI.S6, "Structures Monitoring"	
M	II.B3.1.CP-53	3.5-1, 14	Concrete (inaccessible areas): basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes
M	II.B3.1.CP-83	3.5-1, 12	Concrete (inaccessible areas): basemat, concrete fill-in annulus	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes
M	II.B3.1.CP-75	3.5-1, 23	Concrete (inaccessible areas): basemat; reinforcing steel	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
M	II.B3.1.CP-69	3.5-1, 1	Concrete: basemat	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	Yes
M	II.B3.1.CP-65	3.5-1, 3	Concrete: basemat, concrete fill-in annulus	Concrete	Air – indoor uncontrolled, air – outdoor	Reduction of strength and modulus due to elevated	Plant-specific aging management program	Yes

II CONTAINMENT STRUCTURES
Table B3.1 Mark III Steel Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						temperature (>150°F general; >200°F local)		
M	II.B3.1.C-07	3.5-1, 2	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	II.B3.1.CP-43	3.5-1, 35	Steel elements (accessible areas): drywell shell; drywell head	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.B3.1.CP-113	3.5-1, 4	Steel elements (inaccessible areas): drywell shell; drywell head	Steel	Air – indoor uncontrolled, concrete	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B3.1.C-24	3.5-1, 38	Steel elements: suppression chamber shell (interior surface)	Stainless steel	Air – indoor uncontrolled	Cracking due to stress corrosion cracking	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4,	No

II CONTAINMENT STRUCTURES
Table B3.1 Mark III Steel Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							"10 CFR Part 50, Appendix J"	
M	II.B3.1.CP-158	3.5-1, 7	Steel elements: suppression chamber shell (interior surface)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	Yes

II CONTAINMENT STRUCTURES
Table B3.2 Mark III Concrete Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	II.B3.2.CP-84	3.5-1, 24	Concrete (accessible areas): dome; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor, ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
	II.B3.2.CP-52	3.5-1, 18	Concrete (accessible areas): dome; wall; basemat	Concrete	Air – outdoor, ground water/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.B3.2.CP-60	3.5-1, 19	Concrete (accessible areas): dome; wall; basemat	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.B3.2.CP-55	3.5-1, 20	Concrete (accessible areas): dome; wall; basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
M	II.B3.2.CP-88	3.5-1, 21	Concrete (accessible areas): dome; wall; basemat; reinforcing steel	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.B3.2.CP-73	3.5-1, 24	Concrete (inaccessible areas): dome; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor, ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures	No

II CONTAINMENT STRUCTURES
Table B3.2 Mark III Concrete Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						attack	Monitoring"	
M	II.B3.2.CP-135	3.5-1, 11	Concrete (inaccessible areas): dome; wall; basemat	Concrete	Air – outdoor, ground water/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program	Yes
M	II.B3.2.CP-121	3.5-1, 12	Concrete (inaccessible areas): dome; wall; basemat	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes
M	II.B3.2.CP-122	3.5-1, 14	Concrete (inaccessible areas): dome; wall; basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes
M	II.B3.2.CP-89	3.5-1, 23	Concrete (inaccessible areas): dome; wall; basemat; reinforcing steel	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
M	II.B3.2.CP-105	3.5-1, 1	Concrete elements: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	Yes

II CONTAINMENT STRUCTURES
Table B3.2 Mark III Concrete Containments

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.B3.2.CP-108	3.5-1, 3	Concrete: dome; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program	Yes
M	II.B3.2.C-07	3.5-1, 2	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	II.B3.2.CP-35	3.5-1, 35	Steel elements (accessible areas): liner; liner anchors; integral attachments	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.B3.2.CP-98	3.5-1, 5	Steel elements (inaccessible areas): liner; liner anchors; integral attachments	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE" and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B3.2.C-24	3.5-1, 38	Steel elements: suppression chamber shell (interior surface)	Stainless steel	Air – indoor uncontrolled	Cracking due to stress corrosion cracking	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No

B4. COMMON COMPONENTS

Systems, Structures, and Components

This section addresses the common components of boiling water reactor (BWR) containments. The common components include (i) penetration sleeves and bellows, (ii) dissimilar metal welds, (iii) personnel airlock, (iv) equipment hatch, (v) control rod drive (CRD) and hatch, (vi) seals, (vii) gaskets, and (viii) moisture barriers.

System Interfaces

Functional interfaces include the primary containment heating and ventilation system (VII.F3), containment isolation components (V.C), and standby gas treatment system (V.B). Physical interfaces exist with any structure, system, or component that either penetrates the containment wall, such as the main steam (MS) system (VIII.B2) and the feedwater (FW) system (VIII.D2), or is supported by the containment structure. The containment structure basemat may provide support to the nuclear steam supply system components and containment internal structures.

II CONTAINMENT STRUCTURES
Table B4 Common Components

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	II.B4.CP-40	3.5-1, 26	Moisture barriers (caulking, flashing, other sealants)	Elastomer, rubber and other similar materials	Air – indoor uncontrolled	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
	II.B4.CP-36	3.5-1, 35	Penetration sleeves	Steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.B4.CP-38	3.5-1, 10	Penetration sleeves; penetration bellows	Stainless steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B4.CP-37	3.5-1, 27	penetration sleeves; penetration bellows	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.B4.C-16	3.5-1, 28	Personnel airlock, equipment hatch, CRD hatch	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No

II Table B4 CONTAINMENT STRUCTURES Common Components

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.B4.C-13	3.5-1, 9	Personnel airlock, equipment hatch, CRD hatch, penetration sleeves; penetration bellows	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis"	Yes
M	II.B4.CP-39	3.5-1, 29	Personnel airlock, equipment hatch, CRD hatch: locks, hinges, closure mechanisms	Steel	Air – indoor uncontrolled, air – outdoor	Loss of leak tightness due to mechanical wear	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.B4.CP-150	3.5-1, 30	Pressure-retaining bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.B4.CP-148	3.5-1, 31	Pressure-retaining bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
	II.B4.CP-41	3.5-1, 33	Seals and gaskets	Elastomer, rubber and other similar materials	Air – indoor uncontrolled, air – outdoor	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.B4.CP-152	3.5-1, 34	Service Level I coatings	Coatings	Air – indoor uncontrolled	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling,	AMP XI.S8, "Protective Coating Monitoring and	No

II CONTAINMENT STRUCTURES
Table B4 Common Components

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						delamination, rusting, physical damage	Maintenance"	

CHAPTER III

STRUCTURES AND COMPONENT SUPPORTS

III STRUCTURES AND COMPONENT SUPPORTS

III A. SAFETY-RELATED AND OTHER STRUCTURES

Safety-related structures are those defined pursuant to 10 CFR 54.4(a)(1), and the other structures are those defined pursuant to 10 CFR 54.4(a)(2) and 10 CFR 54.4(a)(3). Structures in this section are organized into nine groups and are discussed separately under subheadings A1 through A9.

III B. COMPONENT SUPPORTS

Component supports include supports for American Society of Mechanical Engineers (ASME) piping and components; supports for cable trays, conduit, heating, ventilation, and air conditioning (HVAC) ducts, TubeTrack®, instrument tubing, nonASME piping and components; anchorage of racks, panels, cabinets, and enclosures for electrical equipment and instrumentation; supports for emergency diesel generator (EDG) and HVAC system components; and supports for platforms, pipe whip restraints, jet impingement shields, masonry walls, and other miscellaneous structures.

III SAFETY-RELATED AND OTHER STRUCTURES

A1. GROUP 1 STRUCTURES (BWR REACTOR BLDG., PWR SHIELD BLDG., CONTROL ROOM/BLDG.)

A2. GROUP 2 STRUCTURES (BWR REACTOR BLDG. WITH STEEL SUPERSTRUCTURE)

A3. GROUP 3 STRUCTURES (AUXILIARY BLDG., DIESEL GENERATOR BLDG., RADWASTE BLDG., TURBINE BLDG., SWITCHGEAR RM.,YARD STRUCTURES, SUCH AS AFW PUMPHOUSE, UTILITY/PIPING TUNNELS, SECURITY/LIGHTING POLES, MANHOLES, DUCT BANKS; SBO STRUCTURES, SUCH AS TRANSMISSION TOWERS, STARTUP TOWERS CIRCUIT BREAKER FOUNDATION, ELECTRICAL ENCLOSURE)

A4. GROUP 4 STRUCTURES (CONTAINMENT INTERNAL STRUCTURES, EXCLUDING REFUELING CANAL)

A5. GROUP 5 STRUCTURES (FUEL STORAGE FACILITY, REFUELING CANAL)

A6. GROUP 6 STRUCTURES (WATER-CONTROL STRUCTURES)

A7. GROUP 7 STRUCTURES (CONCRETE TANKS AND MISSILE BARRIERS)

A8. GROUP 8 STRUCTURES (STEEL TANKS AND MISSILE BARRIERS)

A9. GROUP 9 STRUCTURES (BWR UNIT VENT STACK)

A1. GROUP 1 STRUCTURES (BOILING WATER REACTOR REACTOR BUILDING, PRESSURIZED WATER REACTOR SHIELD BUILDING, CONTROL ROOM/BUILDING)

Systems, Structures, and Components

This section addresses the elements of the boiling water reactor (BWR) reactor building, pressurized water reactor (PWR) shield building, and control room/building. For this group, the applicable structural elements are concrete, steel, and masonry walls. The aging management review (AMR) is presented for each applicable combination of structural element and aging effect.

System Interfaces

Physical interfaces exist with any system or component that either penetrates the structure wall or is supported by the structure wall, floor, and roof. The direct interface is through the system or component supports that are anchored to the structure. Structures also protect housed systems or components from internal and external design basis events. In the case of tanks, there is a functional interface with the associated system. Water-control structures are integral parts of the systems that provide plant cooling water and residual heat removal (RHR).

III STRUCTURES AND COMPONENT SUPPORTS
Table A1 Group 1 Structures (BWR Reactor Bldg., PWR Shield Bldg., Control Room/Bldg.)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A1.TP-25	3.5-1, 54	Concrete (accessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-27	3.5-1, 65	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-23	3.5-1, 64	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-24	3.5-1, 63	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-26	3.5-1, 66	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A1.TP-204	3.5-1, 43	Concrete (inaccessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes

III STRUCTURES AND COMPONENT SUPPORTS
Table A1 Group 1 Structures (BWR Reactor Bldg., PWR Shield Bldg., Control Room/Bldg.)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A1.TP-212	3.5-1, 65	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-29	3.5-1, 67	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A1.TP-67	3.5-1, 47	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes
M	III.A1.TP-108	3.5-1, 42	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, ground water/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program	Yes
M	III.A1.TP-114	3.5-1, 48	Concrete: all	Concrete	Air – indoor uncontrolled	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program	Yes
M	III.A1.TP-30	3.5-1, 44	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes

III STRUCTURES AND COMPONENT SUPPORTS
Table A1 Group 1 Structures (BWR Reactor Bldg., PWR Shield Bldg., Control Room/Bldg.)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A1.TP-31	3.5-1, 46	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	III.A1.TP-28	3.5-1, 67	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-300	3.5-1, 69	High-strength structural bolting	Low-alloy steel, actual measured yield strength ≥ 150 ksi (1,034 MPa)	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S6, "Structures Monitoring" Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No

III STRUCTURES AND COMPONENT SUPPORTS
Table A1 Group 1 Structures (BWR Reactor Bldg., PWR Shield Bldg., Control Room/Bldg.)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A1.T-12	3.5-1, 70	Masonry walls: all	Concrete block	Air – indoor uncontrolled, air – outdoor	Cracking due to restraint shrinkage, creep, and aggressive environment	AMP XI.S5, "Masonry Walls"	No
N	III.A1.TP-34	3.5-1, 71	Masonry walls: all	Concrete block	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S5, "Masonry Walls"	No
M	III.A1.TP-302	3.5-1, 77	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-261	3.5-1, 88	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A1.TP-248	3.5-1, 80	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-274	3.5-1, 82	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No

A2. GROUP 2 STRUCTURES (BOILING WATER REACTOR REACTOR BUILDING WITH STEEL SUPERSTRUCTURE)

Systems, Structures, and Components

This section addresses the elements of the boiling water reactor (BWR) reactor building with steel superstructure. For this group, the applicable structural elements are identified: (i) concrete, (ii) steel, and (iii) masonry walls. The aging management review (AMR) is presented for each applicable combination of structural element and aging effect.

System Interfaces

Physical interfaces exist with any system or component that either penetrates the structure wall or is supported by the structure wall, floor, and roof. The direct interface is through the system or component supports that are anchored to the structure. Structures also protect housed systems and components from internal and external design basis events. In the case of tanks, there is a functional interface with the associated system. Water-control structures are integral parts of the systems that provide plant cooling water and residual heat removal (RHR).

III STRUCTURES AND COMPONENT SUPPORTS
Table A2 Group 2 Structures (BWR Reactor Bldg. With Steel Superstructure)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A2.TP-25	3.5-1, 54	Concrete (accessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A2.TP-27	3.5-1, 65	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A2.TP-23	3.5-1, 64	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A2.TP-24	3.5-1, 63	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
	III.A2.TP-26	3.5-1, 66	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A2.TP-204	3.5-1, 43	Concrete (inaccessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes

III STRUCTURES AND COMPONENT SUPPORTS
Table A2 Group 2 Structures (BWR Reactor Bldg. With Steel Superstructure)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A2.TP-212	3.5-1, 65	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A2.TP-29	3.5-1, 67	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A2.TP-67	3.5-1, 47	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes
M	III.A2.TP-108	3.5-1, 42	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, ground water/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program	Yes
M	III.A2.TP-114	3.5-1, 48	Concrete: all	Concrete	Air – indoor uncontrolled	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program	Yes
M	III.A2.TP-30	3.5-1, 44	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes

III STRUCTURES AND COMPONENT SUPPORTS
Table A2 Group 2 Structures (BWR Reactor Bldg. With Steel Superstructure)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A2.TP-31	3.5-1, 46	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	III.A2.TP-28	3.5-1, 67	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
	III.A2.TP-300	3.5-1, 69	High-strength structural bolting	Low-alloy steel, actual measured yield strength ≥ 150 ksi (1,034 MPa)	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S6, "Structures Monitoring" Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No

III STRUCTURES AND COMPONENT SUPPORTS
Table A2 Group 2 Structures (BWR Reactor Bldg. With Steel Superstructure)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A2.T-12	3.5-1, 70	Masonry walls: all	Concrete block	Air – indoor uncontrolled, air – outdoor	Cracking due to restraint shrinkage, creep, and aggressive environment	AMP XI.S5, "Masonry Walls"	No
N	III.A2.TP-34	3.5-1, 71	Masonry walls: all	Concrete block	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S5, "Masonry Walls"	No
M	III.A2.TP-302	3.5-1, 77	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A2.TP-261	3.5-1, 88	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A2.TP-248	3.5-1, 80	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A2.TP-274	3.5-1, 82	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No

A3. GROUP 3 STRUCTURES (AUXILIARY BUILDING, DIESEL GENERATOR BUILDING, RADWASTE BUILDING, TURBINE BUILDING, SWITCHGEAR ROOM, YARD STRUCTURES, SUCH AS AUXILIARY FEEDWATER PUMPHOUSE, UTILITY/PIPING TUNNELS, SECURITY/LIGHTING POLES, MANHOLES, DUCT BANKS; STATION BLACKOUT STRUCTURES, SUCH AS TRANSMISSION TOWERS, STARTUP TOWERS CIRCUIT BREAKER FOUNDATION, ELECTRICAL ENCLOSURE)

Systems, Structures, and Components

This section addresses the elements of the auxiliary building, diesel generator building, radwaste building, turbine building, switchgear room, yard structures, and station blackout (SBO) structures. For this group, the applicable structural elements are identified: (i) concrete, (ii) steel, and (iii) masonry walls. The aging management review (AMR) is presented for each applicable combination of structural element and aging effect.

System Interfaces

Physical interfaces exist with any system or component that either penetrates the structure wall or is supported by the structure wall, floor, and roof. The direct interface is through the system or component supports that are anchored to the structure. Structures also protect housed structures and components (SCs) from internal and external design basis events. In the case of tanks, there is a functional interface with the associated system. Water-control structures are integral parts of the systems that provide plant cooling water and residual heat removal (RHR).

III STRUCTURES AND COMPONENT SUPPORTS

Table A3 Group 3 Structures (Auxiliary Bldg., Diesel Generator Bldg., Radwaste Bldg., Turbine Bldg., Switchgear Rm., Yard Structures Such As AFW Pumphouse Utility/Piping Tunnels, Security/Lighting Poles, Manholes, Duct Banks; SBO Structures Such As Transmission Towers, Startup Tower Circuit Breaker Foundation, Electrical Enclosure)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A3.TP-25	3.5-1, 54	Concrete (accessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-27	3.5-1, 65	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-23	3.5-1, 64	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-24	3.5-1, 63	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-26	3.5-1, 66	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A3.TP-204	3.5-1, 43	Concrete (inaccessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes

III — STRUCTURES AND COMPONENT SUPPORTS

Table A3 — Group 3 Structures (Auxiliary Bldg., Diesel Generator Bldg., Radwaste Bldg., Turbine Bldg., Switchgear Rm., Yard Structures Such As AFW Pumphouse Utility/Piping Tunnels, Security/Lighting Poles, Manholes, Duct Banks; SBO Structures Such As Transmission Towers, Startup Tower Circuit Breaker Foundation, Electrical Enclosure)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A3.TP-212	3.5-1, 65	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-29	3.5-1, 67	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A3.TP-67	3.5-1, 47	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes
M	III.A3.TP-108	3.5-1, 42	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, ground water/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program	Yes
M	III.A3.TP-114	3.5-1, 48	Concrete: all	Concrete	Air – indoor uncontrolled	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program	Yes

III Table A3 — STRUCTURES AND COMPONENT SUPPORTS

Group 3 Structures (Auxiliary Bldg., Diesel Generator Bldg., Radwaste Bldg., Turbine Bldg., Switchgear Rm., Yard Structures Such As AFW Pumphouse Utility/Piping Tunnels, Security/Lighting Poles, Manholes, Duct Banks; SBO Structures Such As Transmission Towers, Startup Tower Circuit Breaker Foundation, Electrical Enclosure)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A3.TP-30	3.5-1, 44	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes
M	III.A3.TP-31	3.5-1, 46	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	III.A3.TP-28	3.5-1, 67	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-300	3.5-1, 69	High-strength structural bolting	Low-alloy steel, actual measured yield strength ≥ 150 ksi (1,034 MPa)	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S6, "Structures Monitoring" Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to	No

III Table A3 — STRUCTURES AND COMPONENT SUPPORTS
Group 3 Structures (Auxiliary Bldg., Diesel Generator Bldg., Radwaste Bldg., Turbine Bldg., Switchgear Rm., Yard Structures Such As AFW Pumphouse Utility/Piping Tunnels, Security/Lighting Poles, Manholes, Duct Banks; SBO Structures Such As Transmission Towers, Startup Tower Circuit Breaker Foundation, Electrical Enclosure)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							SCC. SCC potential need not be evaluated for these bolts.	
	III.A3.T-12	3.5-1, 70	Masonry walls: all	Concrete block	Air – indoor uncontrolled, air – outdoor	Cracking due to restraint shrinkage, creep, and aggressive environment	AMP XI.S5, "Masonry Walls"	No
N	III.A3.TP-34	3.5-1, 71	Masonry walls: all	Concrete block	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S5, "Masonry Walls"	No
M	III.A3.TP-302	3.5-1, 77	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-219	3.5-1, 79	Steel components: piles	Steel	Ground water/soil	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-261	3.5-1, 88	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A3.TP-248	3.5-1, 80	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-274	3.5-1, 82	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No

A4. GROUP 4 STRUCTURES (CONTAINMENT INTERNAL STRUCTURES, EXCLUDING REFUELING CANAL)

Systems, Structures, and Components

This section addresses the elements of the containment internal structures, excluding refueling canal. For this group, the applicable structural elements are identified: (i) concrete and (ii) steel elements. The aging management review (AMR) is presented for each applicable combination of structural element and aging effect.

System Interfaces

Physical interfaces exist with any system or component that either penetrates the structure wall or is supported by the structure wall, floor, and roof. The direct interface is through the system or component supports that are anchored to the structure. Structures also protect housed systems and components from internal and external design basis events. In the case of tanks, there is a functional interface with the associated system. Water-control structures are integral parts of the systems that provide plant cooling water and residual heat removal (RHR).

III STRUCTURES AND COMPONENT SUPPORTS
Table A4 Group Structures (Containment Internal Structures, Excluding Refueling Canal)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A4.TP-25	3.5-1, 54	Concrete (accessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A4.TP-26	3.5-1, 66	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A4.TP-204	3.5-1, 43	Concrete (inaccessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes
M	III.A4.TP-305	3.5-1, 47	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes
M	III.A4.TP-114	3.5-1, 48	Concrete: all	Concrete	Air – indoor uncontrolled	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program	Yes
M	III.A4.TP-304	3.5-1, 44	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes
	III.A4.TP-28	3.5-1, 67	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling,	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS
Table A4 Group Structures (Containment Internal Structures, Excluding Refueling Canal)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						scaling) due to aggressive chemical attack		
N	III.A4.T-35	3.5-1, 97	Group 4: Concrete (reactor cavity area proximate to the reactor vessel): reactor (primary/biological) shield wall; sacrificial shield wall; reactor vessel support/pedestal structure	Concrete	Air – indoor uncontrolled	Reduction of strength; loss of mechanical properties due to irradiation (i.e., radiation interactions with material and radiation-induced heating)	Plant-specific aging management program	Yes
	III.A4.TP-300	3.5-1, 69	High-strength structural bolting	Low-alloy steel, actual measured yield strength ≥ 150 ksi (1,034 MPa)	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S6, "Structures Monitoring" Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No
M	III.A4.TP-301	3.5-1, 73	Service Level I coatings	Coatings	Air – indoor uncontrolled	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage	AMP XI.S8, "Protective Coating Monitoring and Maintenance"	No

III STRUCTURES AND COMPONENT SUPPORTS
Table A4 Group Structures (Containment Internal Structures, Excluding Refueling Canal)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A4.TP-35	3.5-1, 76	Sliding surfaces: radial beam seats in BWR drywell	Lubrite; Fluorogold; Lubrofluor	Air – indoor uncontrolled	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S6, "Structures Monitoring"	No
M	III.A4.TP-302	3.5-1, 77	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A4.TP-261	3.5-1, 88	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A4.TP-248	3.5-1, 80	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A4.TP-274	3.5-1, 82	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No

A5. GROUP 5 STRUCTURES (FUEL STORAGE FACILITY, REFUELING CANAL)

Systems, Structures, and Components

This section addresses the elements of the fuel storage facility and refueling canal. For this group, the applicable structural elements are identified: (i) concrete, (ii) steel, and (iii) masonry walls. The aging management review (AMR) is presented for each applicable combination of structural element and aging effect.

System Interfaces

Physical interfaces exist with any system or component that either penetrates the structure wall or is supported by the structure wall, floor, and roof. The direct interface is through the system or component supports that are anchored to the structure. Structures also protect housed structures and components (SCs) from internal and external design basis events. In the case of tanks, there is a functional interface with the associated system. Water-control structures are integral parts of the systems that provide plant cooling water and residual heat removal (RHR).

III STRUCTURES AND COMPONENT SUPPORTS
Table A5 Group 5 Structures (Fuel Storage Facility, Refueling Canal)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A5.TP-25	3.5-1, 54	Concrete (accessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-27	3.5-1, 65	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-23	3.5-1, 64	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-24	3.5-1, 63	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-26	3.5-1, 66	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A5.TP-204	3.5-1, 43	Concrete (inaccessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes

III STRUCTURES AND COMPONENT SUPPORTS
Table A5 Group 5 Structures (Fuel Storage Facility, Refueling Canal)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A5.TP-212	3.5-1, 65	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-29	3.5-1, 67	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A5.TP-67	3.5-1, 47	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes
M	III.A5.TP-108	3.5-1, 42	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, ground water/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program	Yes
M	III.A5.TP-114	3.5-1, 48	Concrete: all	Concrete	Air – indoor uncontrolled	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program	Yes
M	III.A5.TP-30	3.5-1, 44	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes

III STRUCTURES AND COMPONENT SUPPORTS
Table A5 Group 5 Structures (Fuel Storage Facility, Refueling Canal)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A5.TP-31	3.5-1, 46	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	III.A5.TP-28	3.5-1, 67	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-300	3.5-1, 69	High-strength structural bolting	Low-alloy steel, actual measured yield strength ≥ 150 ksi (1,034 MPa)	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S6, "Structures Monitoring" Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No

III STRUCTURES AND COMPONENT SUPPORTS
Table A5 Group 5 Structures (Fuel Storage Facility, Refueling Canal)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A5.T-12	3.5-1, 70	Masonry walls: all	Concrete block	Air – indoor uncontrolled, air – outdoor	Cracking due to restraint shrinkage, creep, and aggressive environment	AMP XI.S5, "Masonry Walls"	No
	III.A5.TP-34	3.5-1, 71	Masonry walls: all	Concrete block	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S5, "Masonry Walls"	No
M	III.A5.T-14	3.5-1, 78	Stainless steel fuel pool liner	Stainless steel	Treated water, treated borated water	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	AMP XI.M2, "Water Chemistry," and monitoring of the spent fuel pool water level and leakage from the leak chase channels.	No
M	III.A5.TP-302	3.5-1, 77	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-261	3.5-1, 88	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A5.TP-248	3.5-1, 80	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-274	3.5-1, 82	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No

A6. GROUP 6 STRUCTURES (WATER-CONTROL STRUCTURES)

Systems, Structures, and Components

This section addresses the elements of water-control structures. For this group, the applicable structural elements are identified: (i) concrete, (ii) steel, (iii) masonry walls, and (iv) earthen water-control structures (e.g., dams, embankments, reservoirs). The aging management review (AMR) is presented for each applicable combination of structural element and aging effect.

System Interfaces

Physical interfaces exist with any system or component that either penetrates the structure wall or is supported by the structure wall, floor, and roof. The direct interface is through the system or component supports that are anchored to the structure. Structures also protect housed structures and components (SCs) from internal and external design basis events. In the case of tanks, there is a functional interface with the associated system. Water-control structures are integral parts of the systems that provide plant cooling water and residual heat removal (RHR).

III Table A6 — STRUCTURES AND COMPONENT SUPPORTS — Group 6 Structures (Water-Control Structures)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A6.TP-38	3.5-1, 59	Concrete (accessible areas): all	Concrete	Air – indoor uncontrolled, air – outdoor, ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance programs.	No
N	III.A6.T-34	3.5-1, 96	Concrete (accessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants"	No
M	III.A6.TP-36	3.5-1, 60	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of	No

III STRUCTURES AND COMPONENT SUPPORTS
Table A6 Group 6 Structures (Water-Control Structures)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Engineers dam inspections and maintenance programs.	
M	III.A6.TP-37	3.5-1, 61	Concrete (accessible areas): exterior above- and below-grade; foundation; interior slab	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance programs.	No
	III.A6.TP-104	3.5-1, 65	Concrete (inaccessible areas): all	Concrete	Air – indoor uncontrolled, air – outdoor, ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A6.TP-220	3.5-1, 50	Concrete (inaccessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes
	III.A6.TP-107	3.5-1, 67	Concrete (inaccessible areas): all	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS
Table A6 Group 6 Structures (Water-Control Structures)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						material (spalling, scaling) due to aggressive chemical attack		
M	III.A6.TP-110	3.5-1, 49	Concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Concrete	Air – outdoor, ground water/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program	Yes
M	III.A6.TP-109	3.5-1, 51	Concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes
M	III.A6.TP-30	3.5-1, 44	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes
M	III.A6.T-20	3.5-1, 56	Concrete: exterior above- and below-grade; foundation; interior slab	Concrete	Water – flowing	Loss of material due to abrasion; cavitation	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers	No

III Table A6	STRUCTURES AND COMPONENT SUPPORTS Group 6 Structures (Water-Control Structures)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
							dam inspections and maintenance programs.	
M	III.A6.TP-31	3.5-1, 46	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
M	III.A6.T-22	3.5-1, 58	Earthen water-control structures: dams; embankments; reservoirs; channels; canals; ponds	Various	Air – outdoor, water – flowing or standing	Loss of material; loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance programs.	No
M	III.A6.TP-223	3.5-1, 62	Group 6: Wooden Piles; sheeting	Wood	Air – outdoor, water – flowing or standing, ground water/soil	Loss of material; change in material properties due to weathering, chemical degradation, and	AMP XI.S7, "Inspection of Water-Control Structures Associated	No

III Table A6 — STRUCTURES AND COMPONENT SUPPORTS
Group 6 Structures (Water-Control Structures)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						insect infestation repeated wetting and drying, fungal decay	with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance programs.	
	III.A6.T-12	3.5-1, 70	Masonry walls: all	Concrete block	Air – indoor uncontrolled, air – outdoor	Cracking due to restraint shrinkage, creep, and aggressive environment	AMP XI.S5, "Masonry Walls"	No
N	III.A6.TP-34	3.5-1, 71	Masonry walls: all	Concrete block	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S5, "Masonry Walls"	No
M	III.A6.TP-7	3.5-1, 72	Seals; gasket; moisture barriers (caulking, flashing, and other sealants)	Elastomer, rubber and other similar materials (such as EPDM rubber)	Any	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S6, "Structures Monitoring"	No
	III.A6.TP-261	3.5-1, 88	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A6.TP-248	3.5-1, 80	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS
Table A6 Group 6 Structures (Water-Control Structures)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A6.TP-221	3.5-1, 83	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor, water – flowing or standing	Loss of material due to general, pitting, crevice corrosion	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance programs.	No

A7. GROUP 7 STRUCTURES (CONCRETE TANKS AND MISSILE BARRIERS)

Systems, Structures, and Components

This section addresses the elements of concrete tanks and missile barriers. For this group, the applicable structural elements are identified: (i) concrete and (ii) steel. The aging management review (AMR) is presented for each applicable combination of structural element and aging effect.

System Interfaces

Physical interfaces exist with any system or component that either penetrates the structure wall or is supported by the structure wall, floor, and roof. The direct interface is through the system or component supports that are anchored to the structure. Structures also protect housed structures and components (SCs) from internal and external design basis events. In the case of tanks, there is a functional interface with the associated system. Water-control structures are integral parts of the systems that provide plant cooling water and residual heat removal (RHR).

III STRUCTURES AND COMPONENT SUPPORTS
Table A7 Group 7 Structures (Concrete Tanks and Missile Barriers)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A7.TP-25	3.5-1, 54	Concrete (accessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-27	3.5-1, 65	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-23	3.5-1, 64	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-24	3.5-1, 63	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-26	3.5-1, 66	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A7.TP-204	3.5-1, 43	Concrete (inaccessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes

III Table A7	STRUCTURES AND COMPONENT SUPPORTS Group 7 Structures (Concrete Tanks and Missile Barriers)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	III.A7.TP-212	3.5-1, 65	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-29	3.5-1, 67	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A7.TP-67	3.5-1, 47	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes
M	III.A7.TP-108	3.5-1, 42	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, ground water/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program	Yes
M	III.A7.TP-30	3.5-1, 44	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes
M	III.A7.TP-31	3.5-1, 46	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous	AMP XI.S6, "Structures Monitoring"	Yes

III STRUCTURES AND COMPONENT SUPPORTS
Table A7 Group 7 Structures (Concrete Tanks and Missile Barriers)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						concrete subfoundation		
	III.A7.TP-28	3.5-1, 67	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-300	3.5-1, 69	High-strength structural bolting	Low-alloy steel, actual measured yield strength ≥ 150 ksi (1,034 MPa)	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S6, "Structures Monitoring" Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No
M	III.A7.TP-302	3.5-1, 77	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
M	III.A7.T-23	3.5-1, 52	Steel components: tank liner	Stainless steel	Water – standing	Cracking due to stress corrosion cracking; loss of	Plant-specific aging management	Yes

III STRUCTURES AND COMPONENT SUPPORTS
Table A7 Group 7 Structures (Concrete Tanks and Missile Barriers)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						material due to pitting and crevice corrosion	program	
	III.A7.TP-261	3.5-1, 88	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A7.TP-248	3.5-1, 80	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-274	3.5-1, 82	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No

A8. GROUP 8 STRUCTURES (STEEL TANKS AND MISSILE BARRIERS)

Systems, Structures, and Components

This section addresses the elements of steel tanks and missile barriers. For this group, the applicable structural elements are identified: (i) concrete and (ii) steel. The aging management review (AMR) is presented for each applicable combination of structural element and aging effect.

System Interfaces

Physical interfaces exist with any system or component that either penetrates the structure wall or is supported by the structure wall, floor, and roof. The direct interface is through the system or component supports that are anchored to the structure. Structures also protect housed structures and components (SCs) from internal and external design basis events. In the case of tanks, there is a functional interface with the associated system. Water-control structures are integral parts of the systems that provide plant cooling water and residual heat removal (RHR).

III STRUCTURES AND COMPONENT SUPPORTS
Table A8 Group 8 Structures (Steel Tanks and Missile Barriers)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A8.TP-25	3.5-1, 54	Concrete (accessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A8.TP-27	3.5-1, 65	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A8.TP-23	3.5-1, 64	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A8.TP-24	3.5-1, 63	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
M	III.A8.TP-204	3.5-1, 43	Concrete (inaccessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes
	III.A8.TP-212	3.5-1, 65	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No

III Table A8	STRUCTURES AND COMPONENT SUPPORTS Group 8 Structures (Steel Tanks and Missile Barriers)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	III.A8.TP-29	3.5-1, 67	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A8.TP-67	3.5-1, 47	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes
M	III.A8.TP-108	3.5-1, 42	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, ground water/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program	Yes
M	III.A8.TP-30	3.5-1, 44	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes
M	III.A8.TP-31	3.5-1, 46	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	III.A8.TP-300	3.5-1, 69	High-strength structural bolting	Low-alloy steel, actual measured yield	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S6, "Structures Monitoring" Note: ASTM	No

III STRUCTURES AND COMPONENT SUPPORTS
Table A8 Group 8 Structures (Steel Tanks and Missile Barriers)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
				strength ≥ 150 ksi (1,034 MPa)			A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	
M	III.A8.TP-302	3.5-1, 77	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
M	III.A8.T-23	3.5-1, 52	Steel components: tank liner	Stainless steel	Water – standing	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Plant-specific aging management program	Yes
	III.A8.TP-261	3.5-1, 88	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A8.TP-248	3.5-1, 80	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A8.TP-274	3.5-1, 82	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No

A9. GROUP 9 STRUCTURES (BOILING WATER REACTOR UNIT VENT STACK)

Systems, Structures, and Components

This section addresses the elements of the boiling water reactor (BWR) unit vent stack. For this group, the applicable structural element is identified: concrete. The aging management review (AMR) is presented for each applicable combination of structural element and aging effect.

System Interfaces

Physical interfaces exist with any system or component that either penetrates the structure wall or is supported by the structure wall, floor, and roof. The direct interface is through the system or component supports that are anchored to the structure. Structures also protect housed structures and components (SCs) from internal and external design basis events. In the case of tanks, there is a functional interface with the associated system. Water-control structures are integral parts of the systems that provide plant cooling water and residual heat removal (RHR).

III STRUCTURES AND COMPONENT SUPPORTS
Table A9 Group 9 Structures (BWR Unit Vent Stack)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A9.TP-25	3.5-1, 54	Concrete (accessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-27	3.5-1, 65	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-23	3.5-1, 64	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-24	3.5-1, 63	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-26	3.5-1, 66	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A9.TP-204	3.5-1, 43	Concrete (inaccessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program	Yes

III Table A9	STRUCTURES AND COMPONENT SUPPORTS Group 9 Structures (BWR Unit Vent Stack)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	III.A9.TP-212	3.5-1, 65	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-29	3.5-1, 67	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A9.TP-67	3.5-1, 47	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program	Yes
M	III.A9.TP-108	3.5-1, 42	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, ground water/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program	Yes
M	III.A9.TP-30	3.5-1, 44	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes
M	III.A9.TP-31	3.5-1, 46	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction in foundation strength, cracking due to differential settlement, erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes

III STRUCTURES AND COMPONENT SUPPORTS
Table A9 Group 9 Structures (BWR Unit Vent Stack)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A9.TP-28	3.5-1, 67	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-300	3.5-1, 69	High-strength structural bolting	Low-alloy steel, actual measured yield strength ≥ 150 ksi (1,034 MPa)	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S6, "Structures Monitoring" Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No
	III.A9.TP-261	3.5-1, 88	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A9.TP-248	3.5-1, 80	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-274	3.5-1, 82	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS
Table A9 Group 9 Structures (BWR Unit Vent Stack)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						corrosion		

III COMPONENT SUPPORTS

B1. SUPPORTS FOR ASME PIPING AND COMPONENTS

B1.1 CLASS 1

B1.2 CLASS 2 AND CLASS 3

B1.3 CLASS MC (BWR CONTAINMENT SUPPORTS)

B2. SUPPORTS FOR CABLE TRAYS, CONDUIT, HVAC DUCTS, TUBETRACK®, INSTRUMENT TUBING, NONASME PIPING AND COMPONENTS

B3. ANCHORAGE OF RACKS, PANELS, CABINETS, AND ENCLOSURES FOR ELECTRICAL EQUIPMENT AND INSTRUMENTATION

B4. SUPPORTS FOR EMERGENCY DIESEL GENERATOR (EDG), HVAC SYSTEM COMPONENTS, AND OTHER MISCELLANEOUS MECHANICAL EQUIPMENT

B5. SUPPORTS FOR PLATFORMS, PIPE WHIP RESTRAINTS, JET IMPINGEMENT SHIELDS, MASONRY WALLS, AND OTHER MISCELLANEOUS STRUCTURES

B1. SUPPORTS FOR ASME PIPING AND COMPONENTS

Systems, Structures, and Components

This section addresses supports and anchorage for American Society of Mechanical Engineers (ASME) piping systems and components. It is subdivided into Class 1 (III.B1.1), Class 2 and Class 3 (III.B1.2), and Class MC (III.B1.3). Applicable aging effects are identified and the aging management review (AMR) is presented for each applicable combination of support component and aging effect.

System Interfaces

Physical interfaces exist with the structure, system, or component being supported and with the building structural element to which the support is anchored. A primary function of supports is to provide anchorage of the supported element for internal and external design basis events so that the supported element can perform its intended function.

III STRUCTURES AND COMPONENT SUPPORTS
Table B1.1 Class 1

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.B1.1.TP-42	3.5-1, 55	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Concrete; grout	Air – indoor uncontrolled, air – outdoor	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	AMP XI.S6, "Structures Monitoring"	No
M	III.B1.1.T-28	3.5-1, 57	Constant and variable load spring hangers; guides; stops	Steel	Air – indoor uncontrolled, air – outdoor	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
M	III.B1.1.TP-41	3.5-1, 68	High-strength structural bolting	Low-alloy steel, actual measured yield strength ≥ 150 ksi (1,034 MPa)	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
M	III.B1.1.TP-45	3.5-1, 75	Sliding surfaces	Lubrite®; graphitic tool steel; Fluorogold; Lubrofluor	Air – indoor uncontrolled, air – outdoor	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
	III.B1.1.TP-229	3.5-1, 87	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S3, "ASME Section XI, Subsection IWF"	No

III Table B1.1	STRUCTURES AND COMPONENT SUPPORTS Class 1							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	III.B1.1.TP-232	3.5-1, 85	Structural bolting	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.S3, "ASME Section XI, Subsection IWF"	No
M	III.B1.1.TP-226	3.5-1, 81	Structural Bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
M	III.B1.1.TP-235	3.5-1, 86	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
	III.B1.1.TP-8	3.5-1, 95	Support members; welds; bolted connections; support anchorage to building structure	Aluminum; galvanized steel; stainless steel	Air – indoor uncontrolled	None	None	No
	III.B1.1.TP-3	3.5-1, 89	Support members; welds; bolted connections; support anchorage to building structure	Galvanized steel; aluminum	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No

III Table B1.1	STRUCTURES AND COMPONENT SUPPORTS Class 1							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	III.B1.1.TP-4	3.5-1, 95	Support members; welds; bolted connections; support anchorage to building structure	Stainless steel	Air with borated water leakage	None	None	No
M	III.B1.1.T-26	3.5-1, 53	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air – indoor uncontrolled	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR, Section 4.3 "Metal Fatigue"	Yes
	III.B1.1.T-24	3.5-1, 91	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting corrosion	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
	III.B1.1.T-25	3.5-1, 89	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	III.B1.1.TP-10	3.5-1, 90	Support members; welds; bolted connections; support	Steel; stainless steel	Treated water <60C (<140 F)	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.S3,	No

III STRUCTURES AND COMPONENT SUPPORTS
Table B1.1 Class 1

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			anchorage to building structure				"ASME Section XI, Subsection IWF"	
	III.B1.1.T-33	3.5-1, 94	Vibration isolation elements	Non-metallic (e.g., rubber)	Air – indoor uncontrolled, air – outdoor	Reduction or loss of isolation function due to radiation hardening, temperature, humidity, sustained vibratory loading	AMP XI.S3, "ASME Section XI, Subsection IWF"	No

III STRUCTURES AND COMPONENT SUPPORTS
Table B1.2 Class 2 and Class 3

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.B1.2.TP-42	3.5-1, 55	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Concrete; grout	Air – indoor uncontrolled, air – outdoor	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	AMP XI.S6, "Structures Monitoring"	No
M	III.B1.2.T-28	3.5-1, 57	Constant and variable load spring hangers; guides; stops	Steel	Air – indoor uncontrolled, air – outdoor	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
M	III.B1.2.TP-45	3.5-1, 75	Sliding surfaces	Lubrite®; graphitic tool steel; Fluorogold; Lubrofluor	Air – indoor uncontrolled, air – outdoor	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
	III.B1.2.TP-229	3.5-1, 87	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
	III.B1.2.TP-232	3.5-1, 85	Structural bolting	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.S3, "ASME Section XI,	No

III Table B1.2 STRUCTURES AND COMPONENT SUPPORTS Class 2 and Class 3

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Subsection IWF"	
M	III.B1.2.TP-226	3.5-1, 81	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
M	III.B1.2.TP-235	3.5-1, 86	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
	III.B1.2.TP-8	3.5-1, 95	Support members; welds; bolted connections; support anchorage to building structure	Aluminum; galvanized steel; stainless steel	Air – indoor uncontrolled	None	None	No
	III.B1.2.TP-3	3.5-1, 89	Support members; welds; bolted connections; support anchorage to building structure	Galvanized steel; aluminum	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
	III.B1.2.TP-4	3.5-1, 95	Support members; welds; bolted connections; support anchorage to building	Stainless steel	Air with borated water leakage	None	None	No

III STRUCTURES AND COMPONENT SUPPORTS
Table B1.2 Class 2 and Class 3

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			structure					
M	III.B1.2.T-26	3.5-1, 53	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air – indoor uncontrolled	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR, Section 4.3 "Metal Fatigue"	Yes
	III.B1.2.T-24	3.5-1, 91	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting corrosion	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
	III.B1.2.T-25	3.5-1, 89	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
	III.B1.2.T-33	3.5-1, 94	Vibration isolation elements	Non-metallic (e.g., rubber)	Air – indoor uncontrolled, air – outdoor	Reduction or loss of isolation function due to radiation hardening, temperature, humidity, sustained vibratory loading	AMP XI.S3, "ASME Section XI, Subsection IWF"	No

III Table B1.3 STRUCTURES AND COMPONENT SUPPORTS Class MC

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.B1.3.TP-42	3.5-1, 55	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Concrete; grout	Air – indoor uncontrolled, air – outdoor	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	AMP XI.S6, "Structures Monitoring"	No
M	III.B1.3.T-28	3.5-1, 57	Constant and variable load spring hangers; guides; stops	Steel	Air – indoor uncontrolled, air – outdoor	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
M	III.B1.3.TP-45	3.5-1, 75	Sliding surfaces	Lubrite®; graphitic tool steel; Fluorogold; Lubrofluor	Air – indoor uncontrolled, air – outdoor	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
	III.B1.3.TP-229	3.5-1, 87	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
	III.B1.3.TP-232	3.5-1, 85	Structural bolting	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP	No

III Table B1.3	STRUCTURES AND COMPONENT SUPPORTS Class MC							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
							XI.S3, "ASME Section XI, Subsection IWF"	
M	III.B1.3.TP-226	3.5-1, 81	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
M	III.B1.3.TP-235	3.5-1, 86	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
	III.B1.3.TP-8	3.5-1, 95	Support members; welds; bolted connections; support anchorage to building structure	Aluminum; galvanized steel; stainless steel	Air – indoor uncontrolled	None	None	No
	III.B1.3.TP-3	3.5-1, 89	Support members; welds; bolted connections; support anchorage to building structure	Galvanized steel; aluminum	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No

III STRUCTURES AND COMPONENT SUPPORTS
Table B1.3 Class MC

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.B1.3.TP-4	3.5-1, 95	Support members; welds; bolted connections; support anchorage to building structure	Stainless steel	Air with borated water leakage	None	None	No
M	III.B1.3.T-26	3.5-1, 53	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air – indoor uncontrolled	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR, Section 4.3 "Metal Fatigue"	Yes
	III.B1.3.T-24	3.5-1, 91	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting corrosion	AMP XI.S3, "ASME Section XI, Subsection IWF"	No
	III.B1.3.T-33	3.5-1, 94	Vibration isolation elements	Non-metallic (e.g., rubber)	Air – indoor uncontrolled, air – outdoor	Reduction or loss of isolation function due to radiation hardening, temperature, humidity, sustained vibratory loading	AMP XI.S3, "ASME Section XI, Subsection IWF"	No

B2. SUPPORTS FOR CABLE TRAYS, CONDUIT, HVAC DUCTS, TUBETRACK®, INSTRUMENT TUBING, NONASME PIPING AND COMPONENTS

Systems, Structures, and Components

This section addresses supports and anchorage for cable trays, conduit, heating, ventilation, and air-conditioning ducts, TubeTrack®, instrument tubing, and non-American Society of Mechanical Engineers (ASME) piping and components. Applicable aging effects are identified and the aging management review (AMR) is presented for each applicable combination of support component and aging effect.

System Interfaces

Physical interfaces exist with the structure, system, or component being supported and with the building structural element to which the support is anchored. A primary function of supports is to provide anchorage of the supported element for internal and external design basis events so that the supported element can perform its intended function.

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.B2.TP-42	3.5-1, 55	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Concrete; grout	Air – indoor uncontrolled, air – outdoor	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	AMP XI.S6, "Structures Monitoring"	No
	III.B2.TP-300	3.5-1, 69	High-strength structural bolting	Low-alloy steel, actual measured yield strength ≥ 150 ksi (1,034 MPa)	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S6, "Structures Monitoring" Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No
M	III.B2.TP-46	3.5-1, 74	Sliding support bearings; sliding support surfaces	Lubrite®; graphitic tool steel; Fluorogold; Lubrofluor	Air – indoor uncontrolled	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS
Table B2 Support for Cable Trays, Conduit, HVAC Ducts, Tube Track, Instrument Tubing, NonASME Piping and Components

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.B2.TP-47	3.5-1, 74	Sliding support bearings; sliding support surfaces	Lubrite®; graphitic tool steel; Fluorogold; Lubrofluor	Air – outdoor	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S6, "Structures Monitoring"	No
	III.B2.TP-261	3.5-1, 88	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.B2.TP-248	3.5-1, 80	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.B2.TP-274	3.5-1, 82	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.B2.TP-8	3.5-1, 95	Support members; welds; bolted connections; support anchorage to building structure	Aluminum; galvanized steel; stainless steel	Air – indoor uncontrolled	None	None	No
	III.B2.TP-3	3.5-1, 89	Support members; welds; bolted connections; support anchorage to building structure	Galvanized steel; aluminum	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No

III Table B2	STRUCTURES AND COMPONENT SUPPORTS Support for Cable Trays, Conduit, HVAC Ducts, Tube Track, Instrument Tubing, NonASME Piping and Components							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	III.B2.TP-6	3.5-1, 93	Support members; welds; bolted connections; support anchorage to building structure	Galvanized steel; aluminum; stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.B2.TP-4	3.5-1, 95	Support members; welds; bolted connections; support anchorage to building structure	Stainless steel	Air with borated water leakage	None	None	No
	III.B2.TP-43	3.5-1, 92	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.B2.T-25	3.5-1, 89	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No

B3. ANCHORAGE OF RACKS, PANELS, CABINETS, AND ENCLOSURES FOR ELECTRICAL EQUIPMENT AND INSTRUMENTATION

Systems, Structures, and Components

This section addresses supports and anchorage for racks, panels, cabinets, and enclosures for electrical equipment and instrumentation. Applicable aging effects are identified and the aging management review (AMR) is presented for each applicable combination of support component and aging effect.

System Interfaces

Physical interfaces exist with the structure, system, or component being supported and with the building structural element to which the support is anchored. A primary function of supports is to provide anchorage of the supported element for internal and external design basis events so that the supported element can perform its intended function.

III Table B3	STRUCTURES AND COMPONENT SUPPORTS Anchorage of Racks, Panels, Cabinets, and Enclosures for Electrical Equipment and Instrumentation							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	III.B3.TP-42	3.5-1, 55	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Concrete; grout	Air – indoor uncontrolled, air – outdoor	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	AMP XI.S6, "Structures Monitoring"	No
	III.B3.TP-300	3.5-1, 69	High-strength structural bolting	Low-alloy steel, actual measured yield strength ≥ 150 ksi (1,034 MPa)	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S6, "Structures Monitoring" Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No
	III.B3.TP-261	3.5-1, 88	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.B3.TP-248	3.5-1, 80	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS
Table B3 Anchorage of Racks, Panels, Cabinets, and Enclosures for Electrical Equipment and Instrumentation

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.B3.TP-274	3.5-1, 82	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.B3.TP-8	3.5-1, 95	Support members; welds; bolted connections; support anchorage to building structure	Aluminum; galvanized steel; stainless steel	Air – indoor uncontrolled	None	None	No
	III.B3.TP-3	3.5-1, 89	Support members; welds; bolted connections; support anchorage to building structure	Galvanized steel; aluminum	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
	III.B3.TP-4	3.5-1, 95	Support members; welds; bolted connections; support anchorage to building structure	Stainless steel	Air with borated water leakage	None	None	No
	III.B3.TP-43	3.5-1, 92	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting corrosion	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS
Table B3 Anchorage of Racks, Panels, Cabinets, and Enclosures for Electrical Equipment and Instrumentation

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.B3.T-25	3.5-1, 89	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No

B4. SUPPORTS FOR EMERGENCY DIESEL GENERATOR, HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM COMPONENTS, AND OTHER MISCELLANEOUS MECHANICAL EQUIPMENT

Systems, Structures, and Components

This section addresses supports and anchorage for the emergency diesel generator (EDG) and heating, ventilation, and air conditioning (HVAC) system components, and other miscellaneous mechanical equipment. Applicable aging effects are identified and the aging management review (AMR) is presented for each applicable combination of support component and aging effect.

System Interfaces

Physical interfaces exist with the structure, system, or component being supported and with the building structural element to which the support is anchored. A primary function of supports is to provide anchorage of the supported element for internal and external design basis events so that the supported element can perform its intended function.

III STRUCTURES AND COMPONENT SUPPORTS
Table B4 Supports for Emergency Diesel Generator, HVAC System Components, and Other Miscellaneous Mechanical Equipment

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.B4.TP-42	3.5-1, 55	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Concrete; grout	Air – indoor uncontrolled, air – outdoor	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	AMP XI.S6, "Structures Monitoring"	No
	III.B4.TP-300	3.5-1, 69	High-strength structural bolting	Low-alloy steel, actual measured yield strength ≥ 150 ksi (1,034 MPa)	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.S6, "Structures Monitoring" Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No
M	III.B4.TP-46	3.5-1, 74	Sliding support bearings; sliding support surfaces	Lubrite®; graphitic tool steel; Fluorogold; Lubrofluor	Air – indoor uncontrolled	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS

Table B4 Supports for Emergency Diesel Generator, HVAC System Components, and Other Miscellaneous Mechanical Equipment

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.B4.TP-47	3.5-1, 74	Sliding support bearings; sliding support surfaces	Lubrite®; graphitic tool steel; Fluorogold; Lubrofluor	Air – outdoor	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S6, "Structures Monitoring"	No
	III.B4.TP-261	3.5-1, 88	Structural bolting	Any	Any environment	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.B4.TP-248	3.5-1, 80	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.B4.TP-274	3.5-1, 82	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.B4.TP-8	3.5-1, 95	Support members; welds; bolted connections; support anchorage to building structure	Aluminum; galvanized steel; stainless steel	Air – indoor uncontrolled	None	None	No
	III.B4.TP-3	3.5-1, 89	Support members; welds; bolted connections; support anchorage to building structure	Galvanized steel; aluminum	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No

III STRUCTURES AND COMPONENT SUPPORTS
Table B4 Supports for Emergency Diesel Generator, HVAC System Components, and Other Miscellaneous Mechanical Equipment

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.B4.TP-6	3.5-1, 93	Support members; welds; bolted connections; support anchorage to building structure	Galvanized steel; aluminum; stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.B4.TP-4	3.5-1, 95	Support members; welds; bolted connections; support anchorage to building structure	Stainless steel	Air with borated water leakage	None	None	No
	III.B4.TP-43	3.5-1, 92	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.B4.T-25	3.5-1, 89	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
	III.B4.TP-44	3.5-1, 94	Vibration isolation elements	Non-metallic (e.g., rubber)	Air – indoor uncontrolled, air – outdoor	Reduction or loss of isolation function due to radiation hardening,	AMP XI.S3, "ASME Section XI, Subsection IWF"AMP	No

III STRUCTURES AND COMPONENT SUPPORTS
Table B4 Supports for Emergency Diesel Generator, HVAC System Components, and Other Miscellaneous Mechanical Equipment

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						temperature, humidity, sustained vibratory loading	XI.S6, "Structures Monitoring"	

B5. SUPPORTS FOR PLATFORMS, PIPE WHIP RESTRAINTS, JET IMPINGEMENT SHIELDS, MASONRY WALLS, AND OTHER MISCELLANEOUS STRUCTURES

Systems, Structures, and Components

This section addresses supports and anchorage for platforms, pipe whip restraints, jet impingement shields, masonry walls, and other miscellaneous structures. Applicable aging effects are identified and the aging management review (AMR) is presented for each applicable combination of support component and aging effect.

System Interfaces

Physical interfaces exist with the structure, system, or component being supported and with the building structural element to which the support is anchored. A primary function of supports is to provide anchorage of the supported element for internal and external design basis events so that the supported element can perform its intended function.

III — STRUCTURES AND COMPONENT SUPPORTS
Table B5 — Supports for Platforms, Pipe Whip Restraints, Jet Impingement Shields, Masonry Walls, and Other Miscellaneous Structures

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	III.B5.T-25							
D	III.B5.TP-248							
D	III.B5.TP-261							
D	III.B5.TP-274							
D	III.B5.TP-3							
D	III.B5.TP-300							
D	III.B5.TP-4							
D	III.B5.TP-42							
D	III.B5.TP-43							

III Table B5	STRUCTURES AND COMPONENT SUPPORTS Supports for Platforms, Pipe Whip Restraints, Jet Impingement Shields, Masonry Walls, and Other Miscellaneous Structures							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
D	III.B5.TP-8							

CHAPTER IV

REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

A1. REACTOR VESSEL (BOILING WATER REACTOR)
A2. REACTOR VESSEL (PRESSURIZED WATER REACTOR)

B1. REACTOR VESSEL INTERNALS (BOILING WATER REACTOR)
B2. REACTOR VESSEL INTERNALS (PRESSURIZED WATER REACTOR)—WESTINGHOUSE
B3. REACTOR VESSEL INTERNALS (PRESSURIZED WATER REACTOR)—COMBUSTION ENGINEERING
B4. REACTOR VESSEL INTERNALS (PRESSURIZED WATER REACTOR)—BABCOCK AND WILCOX

C1. REACTOR COOLANT PRESSURE BOUNDARY (BOILING WATER REACTOR)
C2. REACTOR COOLANT SYSTEM AND CONNECTED LINES (PRESSURIZED WATER REACTOR)

D1. STEAM GENERATOR (RECIRCULATING)
D2. STEAM GENERATOR (ONCE-THROUGH)

E. COMMON MISCELLANEOUS MATERIAL/ENVIRONMENT COMBINATIONS

A1. REACTOR VESSEL (BOILING WATER REACTOR)

Systems, Structures, and Components

This section addresses the boiling water reactor (BWR) pressure vessel and consists of the vessel shell and flanges, attachment welds, top and bottom heads, nozzles (including safe ends) for the reactor coolant recirculating system and connected systems (such as high and low pressure (LP) core spray, high and LP coolant injection, main steam (MS), and feedwater (FW) systems), penetrations for control rod drive (CRD) stub tubes, instrumentation, standby liquid control (SLC), flux monitor, drain lines, and CRD mechanism housings. The support skirt and attachment welds for vessel supports are also included in the following table for the BWR vessel. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all structures and components (SCs) that comprise the reactor vessel are governed by Group A Quality Standards.

Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in IV.E.

System Interfaces

The systems that interface with the reactor vessel include the reactor vessel internals (RVIs) (IV.B1), the reactor coolant pressure boundary (RCPB) (IV.C1), the emergency core cooling system (ECCS) (V.D2), and the standby liquid control (SLC) system (VII.E2).

IV — REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table A1 — Reactor Vessel (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	IV.A1.R-448	3.1-1, 133	Any	Steel	Reactor coolant, treated water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
N	IV.A1.R-412	3.1-1, 97	Control rod drive return line nozzle cap and associated cap-to-nozzle weld or cap-to-safe end weld (BWR-3, BWR-4, BWR-5, and BWR-6 designs)	Stainless steel; nickel alloy	Reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	AMP XI.M7, "BWR Stress Corrosion Cracking," and AMP XI.M2, "Water Chemistry"	Yes
N	IV.A1.R-450	3.1-1, 134	Jacketed thermal insulation	Any	Air – indoor uncontrolled, air – outdoor environment, air with borated water leakage, air with reactor coolant leakage, air with steam or water leakage	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	IV.A1.R-68	3.1-1, 128	Nozzle safe ends and welds: high-pressure core spray; low pressure core spray;	Stainless steel; nickel alloy	Reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	AMP XI.M7, "BWR Stress Corrosion Cracking," and AMP XI.M2, "Water Chemistry"	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table A1 Reactor Vessel (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			recirculating water; low pressure coolant injection or RHR injection mode					
N	IV.A1.R-411	3.1-1, 130	Nozzles and nozzle-to-vessel welds: control rod drive return line (BWR-2 designs)	Steel (with or without stainless steel cladding)	Reactor coolant	Cracking due to cyclic loading	Plant-specific aging management program	Yes
	IV.A1.R-65	3.1-1, 95	Nozzles: feedwater	Steel (with or without stainless steel cladding)	Reactor coolant	Cracking due to cyclic loading	AMP XI.M5, "BWR Feedwater Nozzle"	No
	IV.A1.RP-369	3.1-1, 98	Penetrations: control rod drive stub tubes; in core monitor housings; jet pump instrument; standby liquid control; flux monitor	Stainless steel; nickel alloy	Reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, cyclic loading	AMP XI.M8, "BWR Penetrations," and AMP XI.M2, "Water Chemistry"	No
	IV.A1.RP-371	3.1-1, 30	Penetrations: drain line	Stainless steel; nickel alloy	Reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, cyclic	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table A1 Reactor Vessel (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						loading	IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	
M	IV.A1.R-70	3.1-1, 4	Pressure vessel support skirt and attachment welds	Steel	Air – indoor uncontrolled	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	IV.A1.R-66	3.1-1, 96	Reactor nozzle components control rod drive return line nozzles and nozzle-to-vessel welds (BWR-3, BWR-4, BWR-5, and BWR-6 designs)	Steel (with or without stainless steel cladding)	Reactor coolant	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No
N	IV.A1.R-409	3.1-1, 113	Reactor vessel (external attachments): support skirt and stabilizer attachment brackets	Steel	Air – Indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion, wear	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No
M	IV.A1.RP-201	3.1-1, 1	Reactor Vessel Closure Flange Assembly	High-strength, low-alloy steel	Air with reactor coolant leakage	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table A1 Reactor Vessel (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			Components: closure flanges, studs					
M	IV.A1.RP-51	3.1-1, 91	Reactor Vessel Closure Flange Assembly Components: closure flanges, studs, nuts, and washers	High-strength, low-alloy steel	Air with reactor coolant leakage	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	AMP XI.M3, "Reactor Head Closure Stud Bolting"	No
M	IV.A1.RP-165	3.1-1, 91	Reactor Vessel Closure Flange Assembly Components: closure flanges, studs, nuts, and washers	High-strength, low-alloy steel	Air with reactor coolant leakage	Loss of material due to general, pitting, crevice corrosion, wear	AMP XI.M3, "Reactor Head Closure Stud Bolting"	No
M	IV.A1.R-04	3.1-1, 7	Reactor vessel components: nozzle penetrations; safe ends; thermal sleeves; vessel shells, heads and welds	Steel (with or without nickel-alloy or stainless steel cladding); stainless steel; nickel alloy	Reactor coolant	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table A1 Reactor Vessel (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	IV.A1.RP-157	3.1-1, 85	Reactor Vessel: flanges; nozzles; penetrations; safe ends; vessel shells, heads and welds	Steel (with stainless steel or nickel-alloy cladding); stainless steel; nickel alloy	Reactor coolant	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	IV.A1.RP-227	3.1-1, 14	Reactor Vessel: shell and nozzle components (including associated welds) in the beltline region of the vessel	Steel (with or without cladding)	Reactor coolant, neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement	AMP XI.M31, "Reactor Vessel Material Surveillance," and X.M2, "Neutron Fluence Monitoring"	Yes
M	IV.A1.R-62	3.1-1, 13	Reactor Vessel: shell and nozzle components (including associated welds) in the beltline region of the vessel	Steel (with or without stainless steel cladding)	Reactor coolant, neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, SRP-SLR Section 4.2 "Reactor Vessel Neutron Embrittlement"	Yes
	IV.A1.RP-50	3.1-1, 84	Top head enclosure (without cladding): top head; nozzles (vent, top head spray	Steel	Reactor coolant	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table A1 Reactor Vessel (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			or RCIC, and spare)					
M	IV.A1.R-61	3.1-1, 16	Top head enclosure: vessel flange leak detection line	Stainless steel; nickel alloy	Air with reactor coolant leakage (internal), reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	Plant-specific aging management program	Yes
M	IV.A1.R-64	3.1-1, 94	Vessel shell: attachment welds	Stainless steel; nickel alloy	Reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, cyclic loading	AMP XI.M4, "BWR Vessel ID Attachment Welds," and AMP XI.M2, "Water Chemistry"	No
D	IV.A1.R-67							

A2. REACTOR VESSEL (PRESSURIZED WATER REACTOR)

Systems, Structures, and Components

This section addresses the pressurized water reactor (PWR) vessel pressure boundary and consists of the vessel shell and flanges, the top closure head and bottom head, the control rod drive (CRD) mechanism housings, nozzles (including safe ends) for reactor coolant inlet and outlet lines and safety injection, and penetrations through either the closure head or bottom head domes for instrumentation and leakage monitoring tubes. Attachments to the vessel such as core support pads, as well as pressure vessel support and attachment welds, are also included in the table. Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all systems, structures, and components (SSCs) that comprise the reactor coolant system (RCS) are governed by Group A Quality Standards.

Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in IV.E.

System Interfaces

The systems that interface with the pressurized water reactor (PWR) reactor vessel include the reactor vessel internals [RVIs IV.B2, IV.B3, and IV.B4, respectively, for Westinghouse, Combustion Engineering (CE), and Babcock & Wilcox (B&W designs)], the reactor coolant system (RCS) and connected lines (CL) (IV.C2), and the emergency core cooling system (ECCS) (V.D1).

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table A2 Reactor Vessel (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	IV.A2.RP-154	3.1-1, 19	Bottom-mounted instrument guide tube (external to bottom head)	Stainless steel	Reactor coolant	Cracking due to stress corrosion cracking	Plant-specific aging management program	Yes
M	IV.A2.R-74	3.1-1, 19	Closure head: vessel flange leak detection line	Stainless steel	Air with reactor coolant leakage (internal), reactor coolant	Cracking due to stress corrosion cracking	Plant-specific aging management program	Yes
	IV.A2.R-78	3.1-1, 62	Control rod drive head penetration: flange bolting	Stainless steel	Air with reactor coolant leakage	Cracking due to stress corrosion cracking	AMP XI.M18, "Bolting Integrity"	No
	IV.A2.R-79	3.1-1, 65	Control rod drive head penetration: flange bolting	Stainless steel	Air with reactor coolant leakage	Loss of material due to wear	AMP XI.M18, "Bolting Integrity"	No
	IV.A2.R-80	3.1-1, 66	Control rod drive head penetration: Flange bolting	Stainless steel	Air with reactor coolant leakage	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
M	IV.A2.RP-186	3.1-1, 45	Control rod drive head penetration: nozzles including associated welds	Nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry,"	No

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							and AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs Only)"	
	IV.A2.R-77	3.1-1, 50	Control rod drive head penetration: pressure housing	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No
M	IV.A2.RP-55	3.1-1, 47	Control rod drive head penetration: pressure housing	Stainless steel; nickel alloy	Reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No
N	IV.A2.R-414	3.1-1, 117	Control rod drive penetrations: nozzle thermal	Nickel Alloy; stainless steel	Reactor coolant	Loss of material due to wear	Plant-specific aging management program	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table A2 Reactor Vessel (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			sleeves					
N	IV.A2.R-413	3.1-1, 116	Control rod drive penetrations: nozzles	Nickel alloy	Reactor coolant	Loss of material due to wear	Plant-specific aging management program	Yes
M	IV.A2.RP-57	3.1-1, 40a	Core support pads; core guide lugs	Nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No
	IV.A2.RP-379	3.1-1, 48	External surfaces: reactor vessel top head and bottom head	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion," and AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs Only)"	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table A2 Reactor Vessel (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	IV.A2.RP-28	3.1-1, 88	Flanges; nozzles; penetrations; pressure housings; safe ends; vessel shells, heads welds	Steel (with stainless steel or nickel-alloy cladding); stainless steel; nickel alloy	Reactor coolant	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry"	No
N	IV.A2.R-450	3.1-1, 134	Jacketed thermal insulation	Any	Air – indoor uncontrolled, air – outdoor environment, air with borated water leakage, air with reactor coolant leakage, air with steam or water leakage	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	IV.A2.R-90	3.1-1, 45	Penetrations: head vent pipe (top head); instrument tubes (top head)	Nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry," and AMP XI.M11B, "Cracking of Nickel-Alloy Components	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table A2 Reactor Vessel (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs Only)"	
M	IV.A2.RP-59	3.1-1, 45	Penetrations: instrument tubes (bottom head)	Nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry," and AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs Only)"	No
M	IV.A2.R-70	3.1-1, 4	Pressure vessel support skirt and attachment	Steel	Air – indoor uncontrolled	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table A2 Reactor Vessel (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			welds					
M	IV.A2.RP-54	3.1-1, 1	Reactor Vessel Closure Flange Assembly Components: closure flanges, studs	High-strength, low-alloy steel	Air with reactor coolant leakage	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	IV.A2.RP-52	3.1-1, 92	Reactor Vessel Closure Flange Assembly Components: closure flanges, studs, nuts, washers	High-strength, low-alloy steel	Air with reactor coolant leakage	Cracking due to stress corrosion cracking	AMP XI.M3, "Reactor Head Closure Stud Bolting"	No
M	IV.A2.RP-53	3.1-1, 92	Reactor Vessel Closure Flange Assembly Components: closure flanges, studs, nuts, washers	High-strength, low-alloy steel	Air with reactor coolant leakage	Loss of material due to general, pitting, crevice corrosion, wear	AMP XI.M3, "Reactor Head Closure Stud Bolting"	No
M	IV.A2.R-219	3.1-1, 10	Reactor vessel components: nozzles;	Steel (with or without nickel-alloy or stainless	Reactor coolant	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table A2 Reactor Vessel (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			penetrations; pressure housings; safe ends; thermal sleeves; vessel shells, heads, welds	steel cladding); stainless steel; nickel alloy				
M	IV.A2.RP-234	3.1-1, 46	Reactor vessel nozzles, nozzle safe ends, and welds	Stainless steel; nickel alloy welds and/or buttering	Reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry," and AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs Only)" for nickel alloy components	No

IV Table A2	REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM Reactor Vessel (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	IV.A2.R-17	3.1-1, 49	Reactor Vessel: external surfaces of the vessel (including steel components in the vessel closure flange assembly) and applicable exterior attachments	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	IV.A2.R-85	3.1-1, 18	Reactor Vessel: reactor vessel shell base metal components made from forging materials, including applicable cladding interfaces	Steel SA508-Cl 2 forgings clad (with stainless steel) using a high-heat-input welding process	Reactor coolant	Crack growth due to cyclic loading	TLAA, SRP-SLR Section 4.7, "Other Plant-Specific TLAAs"	Yes
M	IV.A2.RP-229	3.1-1, 14	Reactor Vessel: shell and nozzle components (including associated welds) in the beltline	Steel (with or without cladding)	Reactor coolant, neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement	AMP XI.M31, "Reactor Vessel Material Surveillance," and X.M2, "Neutron Fluence	Yes

IV Table A2	REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM Reactor Vessel (PWR)							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			region of the vessel				Monitoring"	
M	IV.A2.R-84	3.1-1, 13	Reactor Vessel: shell and nozzle components (including associated welds) in the beltline region of the vessel	Steel (with stainless steel or nickel-alloy cladding)	Reactor coolant, neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, SRP-SLR Section 4.2 "Reactor Vessel Neutron Embrittlement"	Yes
M	IV.A2.R-87	3.1-1, 37	Vessel shell: vessel flange	Steel	Reactor coolant	Loss of material due to wear	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No
D	IV.A2.R-81							
D	IV.A2.RP-228							

B1. REACTOR VESSEL INTERNALS (BOILING WATER REACTOR)

Systems, Structures, and Components

This section addresses the boiling water reactor (BWR) vessel internals and consists of the core shroud (including repairs) and core plate, the top guide, feedwater (FW) spargers, core spray lines and spargers, jet pump assemblies, fuel supports and control rod drive (CRD), and instrument housings, such as the intermediate range monitor (IRM) dry tubes, the low power range monitor dry tubes, and the source range monitor (SRM) dry tubes. Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all structures and components (SCs) that comprise the reactor vessel are governed by Group A or B Quality Standards.

Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in IV.E.

System Interfaces

The systems that interface with the reactor vessel internals include the reactor pressure vessel (RPV) (IV.A1) and the reactor coolant pressure boundary (RCPB) (IV.C1).

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B1 Reactor Vessel Internals (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	IV.B1.R-416	3.1-1, 99	Control Rod Guide Tube Base	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F), neutron flux	Loss of fracture toughness due to thermal aging, neutron irradiation embrittlement	AMP XI.M9, "BWR Vessel Internals"	Yes
N	IV.B1.R-420	3.1-1, 120	Core plate rim holddown bolts	Stainless steel	Reactor coolant, neutron flux	Loss of preload due to thermal or irradiation-enhanced stress relaxation	AMP XI.M9, "BWR Vessel Internals," and TLAA SRP-SLR 4.7 "Other Plant-Specific TLAAs" (if an analysis is performed as part of the aging management basis and conforms to the definition of a TLAA in 10 CFR 54.3(a))	Yes
M	IV.B1.R-92	3.1-1, 103	Core shroud (including repairs) and core plate: core shroud (upper, central, lower)	Stainless steel	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	AMP XI.M9, "BWR Vessel Internals," and AMP XI.M2, "Water Chemistry"	Yes
M	IV.B1.R-96	3.1-1, 103	Core shroud (including repairs) and core plate:	Nickel alloy	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, intergranular	AMP XI.M9, "BWR Vessel Internals," and AMP	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B1 Reactor Vessel Internals (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			shroud support structure (shroud support cylinder, shroud support plate, shroud support legs)			stress corrosion cracking, irradiation-assisted stress corrosion cracking	XI.M2, "Water Chemistry"	
M	IV.B1.R-95	3.1-1, 41	Core shroud and core plate: access hole cover (mechanical)	Nickel alloy	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	Yes
M	IV.B1.R-94	3.1-1, 29	Core shroud and core plate: access hole cover (welded)	Nickel alloy	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	Yes
M	IV.B1.R-93	3.1-1, 103	Core shroud and core plate: core plate and plate bolts (used in early BWRs)	Stainless steel	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking,	AMP XI.M9, "BWR Vessel Internals," and AMP XI.M2, "Water	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B1 Reactor Vessel Internals (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						irradiation-assisted stress corrosion cracking	Chemistry"	
M	IV.B1.R-97	3.1-1, 103	Core shroud and core plate: LPCI coupling	Stainless steel	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	AMP XI.M9, "BWR Vessel Internals," and AMP XI.M2, "Water Chemistry"	Yes
M	IV.B1.R-99	3.1-1, 103	Core spray lines and spargers: core spray lines (headers); spray rings; spray nozzles; thermal sleeves	Stainless steel	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	AMP XI.M9, "BWR Vessel Internals," and AMP XI.M2, "Water Chemistry"	Yes
N	IV.B1.R-417	3.1-1, 99	Core Spray Sparger Nozzle Elbows	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F), neutron flux	Loss of fracture toughness due to thermal aging, neutron irradiation embrittlement	AMP XI.M9, "BWR Vessel Internals"	Yes
M	IV.B1.R-104	3.1-1, 102	Fuel supports and control rod drive assemblies: control rod drive housing	Stainless steel	Reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	AMP XI.M9, "BWR Vessel Internals," and AMP XI.M2, "Water Chemistry"	No

IV Table B1	REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM Reactor Vessel Internals (BWR)							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	IV.B1.RP-220	3.1-1, 99	Fuel supports and control rod drive assemblies: orificed fuel support	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F), neutron flux	Loss of fracture toughness due to thermal aging, neutron irradiation embrittlement	AMP XI.M9, "BWR Vessel Internals"	Yes
M	IV.B1.R-105	3.1-1, 103	Instrumentation: Intermediate range monitor (IRM) dry tubes; source range monitor (SRM) dry tubes; incore neutron flux monitor guide tubes	Stainless steel	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	AMP XI.M9, "BWR Vessel Internals," and AMP XI.M2, "Water Chemistry"	Yes
M	IV.B1.RP-219	3.1-1, 99	Jet pump assemblies: castings	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F), neutron flux	Loss of fracture toughness due to thermal aging, neutron irradiation embrittlement	AMP XI.M9, "BWR Vessel Internals"	Yes
M	IV.B1.R-100	3.1-1, 103	Jet pump assemblies: thermal sleeve; inlet header; riser brace arm; holddown beams; inlet elbow; mixing assembly; diffuser castings	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	AMP XI.M9, "BWR Vessel Internals," and AMP XI.M2, "Water Chemistry"	Yes
N	IV.B1.R-421	3.1-1, 121	Jet pump assembly holddown beam bolts	Stainless steel	Reactor coolant, neutron flux	Loss of preload due to thermal or irradiation-enhanced stress relaxation	AMP XI.M9, "BWR Vessel Internals"	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B1 Reactor Vessel Internals (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	IV.B1.R-419	3.1-1, 99	LPCI Coupling	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F), neutron flux	Loss of fracture toughness due to thermal aging, neutron irradiation embrittlement	AMP XI.M9, "BWR Vessel Internals"	Yes
M	IV.B1.R-53	3.1-1, 3	Reactor vessel internal components	Stainless steel; nickel alloy	Reactor coolant	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	IV.B1.RP-381	3.1-1, 104	Reactor vessel internals components	Nickel alloy	Reactor coolant, neutron flux	Cracking due to intergranular stress corrosion cracking	AMP XI.M9, "BWR Vessel Internals," and AMP XI.M2, "Water Chemistry"	No
M	IV.B1.RP-200	3.1-1, 99	Reactor vessel internals components	Nickel alloy	Reactor coolant, neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement	AMP XI.M9, "BWR Vessel Internals"	Yes
N	IV.B1.R-422	3.1-1, 103	Reactor vessel internals components	Nickel alloy; Stainless steel	Reactor coolant, neutron flux	Cracking due to irradiation-assisted stress corrosion cracking	AMP XI.M9, "BWR Vessel Internals," and AMP XI.M2, "Water Chemistry"	Yes
M	IV.B1.RP-182	3.1-1, 99	Reactor vessel internals components	PH martensitic stainless steel (17-4PH and 15-5PH); martensitic stainless steel (SS 403, 410,	Reactor coolant >250°C (>482°F), neutron flux	Loss of fracture toughness due to thermal aging, neutron irradiation embrittlement	AMP XI.M9, "BWR Vessel Internals"	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B1 Reactor Vessel Internals (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
				431, etc.)				
M	IV.B1.RP-26	3.1-1, 43	Reactor vessel internals components	Stainless steel; nickel alloy	Reactor coolant	Loss of material due to pitting, crevice corrosion	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No
	IV.B1.RP-377	3.1-1, 100	Reactor vessel internals components: Jet pump wedge surface	Stainless steel	Reactor coolant	Loss of material due to wear	AMP XI.M9, "BWR Vessel Internals"	No
M	IV.B1.RP-155	3.1-1, 101	Steam dryers	Stainless steel	Reactor coolant	Cracking due to flow-induced vibration; stress corrosion cracking; intergranular stress corrosion cracking; loss of material due to wear	AMP XI.M9, "BWR Vessel Internals"	No
M	IV.B1.R-98	3.1-1, 103	Top guide	Stainless steel	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted	AMP XI.M9, "BWR Vessel Internals," and AMP XI.M2, "Water Chemistry"	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B1 Reactor Vessel Internals (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						stress corrosion cracking		

B2. REACTOR VESSEL INTERNALS (PRESSURIZED WATER REACTOR)—WESTINGHOUSE

Systems, Structures, and Components

This section addresses the Westinghouse pressurized water reactor (PWR) vessel internals, which consist of components in the upper internals assembly, the control rod guide tube (CRGT) assembly, the core barrel (CB) assembly, the baffle/former assembly, the lower internals assembly, lower support assembly, thermal shield assembly, bottom mounted instrumentation system, and alignment and interfacing components.

Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in IV.E.

System Interfaces

The systems that interface with the reactor vessel internals include the reactor pressure vessel (RPV) (IV.A2).

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B2 Reactor Vessel Internals (PWR)—Westinghouse

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	IV.B2.RP-284	3.1-1, 54	Bottom mounted instrument system: flux thimble tubes	Nickel alloy; stainless steel (with or without chrome plating)	Reactor coolant, neutron flux	Loss of material due to wear	AMP XI.M37, "Flux Thimble Tube Inspection"	No
N	IV.B2.R-423	3.1-1, 118	Reactor vessel internal components	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, cyclical loading, fatigue	Plant-specific aging management program	Yes
N	IV.B2.R-424	3.1-1, 119	Reactor vessel internal components	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement or thermal aging embrittlement; changes in dimensions due to void swelling or distortion; loss of preload due to thermal and irradiation enhanced stress relaxation or creep; loss of material due to wear	Plant-specific aging management program	Yes
	IV.B2.RP-24	3.1-1, 87	Reactor vessel internal components	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry"	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B2 Reactor Vessel Internals (PWR)—Westinghouse

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	IV.B2.RP-303	3.1-1, 3	Reactor vessel internal components: internals with metal fatigue analyses or other types of cyclical loading analyses	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
D	IV.B2.RP-265							
D	IV.B2.RP-270							
D	IV.B2.RP-270a							
D	IV.B2.RP-271							
D	IV.B2.RP-272							
D	IV.B2.RP-273							
D	IV.B2.RP-274							

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B2 Reactor Vessel Internals (PWR)—Westinghouse

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B2.RP-275							
D	IV.B2.RP-276							
D	IV.B2.RP-278							
D	IV.B2.RP-278a							
D	IV.B2.RP-280							
D	IV.B2.RP-285							
D	IV.B2.RP-286							
D	IV.B2.RP-287							
D	IV.B2.RP-288							

IV Table B2	REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM Reactor Vessel Internals (PWR)—Westinghouse							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B2.RP-289							
D	IV.B2.RP-290							
D	IV.B2.RP-290a							
D	IV.B2.RP-290b							
D	IV.B2.RP-291							
D	IV.B2.RP-291a							
D	IV.B2.RP-291b							
D	IV.B2.RP-292							
D	IV.B2.RP-293							

IV — REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B2 — Reactor Vessel Internals (PWR)—Westinghouse

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B2.RP-294							
D	IV.B2.RP-295							
D	IV.B2.RP-296							
D	IV.B2.RP-297							
D	IV.B2.RP-298							
D	IV.B2.RP-299							
D	IV.B2.RP-300							
D	IV.B2.RP-301							
D	IV.B2.RP-302							

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B2.RP-302a							
D	IV.B2.RP-345							
D	IV.B2.RP-346							
D	IV.B2.RP-354							
D	IV.B2.RP-355							
D	IV.B2.RP-356							
D	IV.B2.RP-382							
D	IV.B2.RP-387							
D	IV.B2.RP-387a							

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B2 Reactor Vessel Internals (PWR)—Westinghouse

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B2.RP-388							
D	IV.B2.RP-388a							
D	IV.B2.RP-399							

B3. REACTOR VESSEL INTERNALS (PRESSURIZED WATER REACTOR)—COMBUSTION ENGINEERING

Systems, Structures, and Components

This section addresses the Combustion Engineering (CE) pressurized water reactor (PWR) vessel internals, which consist of components in the upper internals assembly, the control element assembly (CEA), the core support barrel assembly, the core shroud assembly, and the lower support structure assembly, and incore instrumentation components.

Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in IV.E.

System Interfaces

The systems that interface with the reactor vessel internals include the reactor pressure vessel (RPV) (IV.A2).

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B3 Reactor Vessel Internals (PWR)—Combustion Engineering

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	IV.B3.R-423	3.1-1, 118	Reactor vessel internal components	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, cyclical loading, fatigue	Plant-specific aging management program	Yes
N	IV.B3.R-424	3.1-1, 119	Reactor vessel internal components	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement or thermal aging embrittlement; changes in dimensions due to void swelling or distortion; loss of preload due to thermal and irradiation enhanced stress relaxation or creep; loss of material due to wear	Plant-specific aging management program	Yes
	IV.B3.RP-24	3.1-1, 87	Reactor vessel internal components	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry"	No
M	IV.B3.RP-339	3.1-1, 3	Reactor vessel internal components: internals with metal fatigue analyses or other types	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes

IV — REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B3 — Reactor Vessel Internals (PWR)—Combustion Engineering

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			of cyclical loading analyses					
D	IV.B3.RP-306							
D	IV.B3.RP-312							
D	IV.B3.RP-313							
D	IV.B3.RP-314							
D	IV.B3.RP-315							
D	IV.B3.RP-316							
D	IV.B3.RP-317							
D	IV.B3.RP-318							

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B3 Reactor Vessel Internals (PWR)—Combustion Engineering

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B3.RP-319							
D	IV.B3.RP-320							
D	IV.B3.RP-322							
D	IV.B3.RP-323							
D	IV.B3.RP-324							
D	IV.B3.RP-325							
D	IV.B3.RP-326							
D	IV.B3.RP-326a							
D	IV.B3.RP-327							

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B3 Reactor Vessel Internals (PWR)—Combustion Engineering

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B3.RP-328							
D	IV.B3.RP-329							
D	IV.B3.RP-330							
D	IV.B3.RP-331							
D	IV.B3.RP-332							
D	IV.B3.RP-333							
D	IV.B3.RP-334							
D	IV.B3.RP-334a							
D	IV.B3.RP-335							

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

Table B3 Reactor Vessel Internals (PWR)—Combustion Engineering

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B3.RP-336							
D	IV.B3.RP-338							
D	IV.B3.RP-342							
D	IV.B3.RP-343							
D	IV.B3.RP-357							
D	IV.B3.RP-358							
D	IV.B3.RP-359							
D	IV.B3.RP-359a							
D	IV.B3.RP-360							

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B3 Reactor Vessel Internals (PWR)—Combustion Engineering

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B3.RP-361							
D	IV.B3.RP-362							
D	IV.B3.RP-362a							
D	IV.B3.RP-362b							
D	IV.B3.RP-362c							
D	IV.B3.RP-363							
D	IV.B3.RP-364							
D	IV.B3.RP-365							
D	IV.B3.RP-366							

IV Table B3	REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM Reactor Vessel Internals (PWR)—Combustion Engineering							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B3.RP-382							
D	IV.B3.RP-400							

B4. REACTOR VESSEL INTERNALS (PRESSURIZED WATER REACTOR)– BABCOCK AND WILCOX

Systems, Structures, and Components

This section addresses the Babcock & Wilcox (B&W) pressurized water reactor (PWR) vessel internals, which consist of components in the plenum cover assembly, the upper grid assembly, the control rod guide tube (CRGT) assembly, the core support shield assembly, the core barrel (CB) assembly, the lower grid (LG) assembly, incore monitoring instrumentation (IMI) guide tube assembly, and the flow distributor assembly.

Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in IV.E.

System Interfaces

The systems that interface with the reactor vessel internals include the reactor pressure vessel (RPV) (IV.A2).

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B4 Reactor Vessel Internals (PWR)—Babcock & Wilcox

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	IV.B4.R-423	3.1-1, 118	Reactor vessel internal components	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, cyclical loading, fatigue	Plant-specific aging management program	Yes
N	IV.B4.R-424	3.1-1, 119	Reactor vessel internal components	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement or thermal aging embrittlement; changes in dimensions due to void swelling or distortion; loss of preload due to thermal and irradiation enhanced stress relaxation or creep; loss of material due to wear	Plant-specific aging management program	Yes
	IV.B4.RP-24	3.1-1, 87	Reactor vessel internal components	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry"	No
M	IV.B4.RP-376	3.1-1, 15	Reactor vessel internal components	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Reduction in fracture toughness due to neutron irradiation	TLAA, SRP-SLR Section 4.7, "Other Plant-Specific TLAAs"	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B4 Reactor Vessel Internals (PWR)—Babcock & Wilcox

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	IV.B4.R-53	3.1-1, 3	Reactor vessel internal components: internals with metal fatigue analyses or other types of cyclical loading analyses	Stainless steel; nickel alloy	Reactor coolant, neutron flux	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
D	IV.B4.RP-236							
D	IV.B4.RP-240							
D	IV.B4.RP-240a							
D	IV.B4.RP-241							
D	IV.B4.RP-241a							
D	IV.B4.RP-242							
D	IV.B4.RP-242a							

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B4 Reactor Vessel Internals (PWR)—Babcock & Wilcox

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B4.RP-243							
D	IV.B4.RP-243a							
D	IV.B4.RP-244							
D	IV.B4.RP-244a							
D	IV.B4.RP-245							
D	IV.B4.RP-245a							
D	IV.B4.RP-245b							
D	IV.B4.RP-246							
D	IV.B4.RP-246a							

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B4 Reactor Vessel Internals (PWR)—Babcock & Wilcox

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B4.RP-246b							
D	IV.B4.RP-247							
D	IV.B4.RP-247a							
D	IV.B4.RP-247b							
D	IV.B4.RP-248							
D	IV.B4.RP-248a							
D	IV.B4.RP-248b							
D	IV.B4.RP-249							
D	IV.B4.RP-249a							

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B4 Reactor Vessel Internals (PWR)—Babcock & Wilcox

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B4.RP-250							
D	IV.B4.RP-250a							
D	IV.B4.RP-251							
D	IV.B4.RP-251a							
D	IV.B4.RP-252							
D	IV.B4.RP-252a							
D	IV.B4.RP-254							
D	IV.B4.RP-254a							
D	IV.B4.RP-254b							

IV Table B4	REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM Reactor Vessel Internals (PWR)—Babcock & Wilcox							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
D	IV.B4.RP-256							
D	IV.B4.RP-256a							
D	IV.B4.RP-256b							
D	IV.B4.RP-258							
D	IV.B4.RP-258a							
D	IV.B4.RP-259							
D	IV.B4.RP-259a							
D	IV.B4.RP-260							
D	IV.B4.RP-260a							

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table B4 Reactor Vessel Internals (PWR)—Babcock & Wilcox

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	IV.B4.RP-261							
D	IV.B4.RP-262							
D	IV.B4.RP-352							
D	IV.B4.RP-375							
D	IV.B4.RP-375a							
D	IV.B4.RP-382							
D	IV.B4.RP-400							
D	IV.B4.RP-401							

C1. REACTOR COOLANT PRESSURE BOUNDARY (BOILING WATER REACTOR)

Systems, Structures, and Components

This section addresses the boiling water reactor (BWR) primary coolant pressure boundary and consists of the reactor coolant recirculation system and portions of other systems connected to the pressure vessel extending to the second containment isolation valve or to the first anchor point outside containment. The connected systems include the residual heat removal (RHR), low–pressure core spray (LPCS), high–pressure core spray (HPCS), low-pressure coolant injection (LPCI) high-pressure coolant injection (HPCI), reactor core isolation cooling (RCIC), isolation condenser (IC), reactor water cleanup (RWCU), standby liquid control (SLC) feedwater (FW), and main steam (MS) systems; and the steam line to the HPCI and RCIC pump turbines. Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all systems, structures and components (SSCs) that comprise the reactor coolant pressure boundary (RCPB) are governed by Group A Quality Standards.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration, or are subject to replacement based on qualified life or specified time period. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in IV.E.

System Interfaces

The systems that interface with the RCPB include the reactor pressure vessel (IV.A1), the emergency core cooling system (V.D2), the SLC system (VII.E2), the RWCU system (VII.E3), the shutdown cooling (SDC) system (older plants) (VII.E4), the MS system (VIII.B2), and the FW system (VIII.D2).

IV REACTOR VESSEL, INTERNALS AND REACTOR COOLANT SYSTEM
Table C1 Reactor Coolant Pressure Boundary (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	IV.C1.R-448	3.1-1, 133	Any	Steel	Reactor coolant, treated water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
M	IV.C1.RP-230	3.1-1, 39	Class 1 piping, fittings and branch connections < NPS 4	Steel (with or without stainless steel or nickel alloy cladding); stainless steel; nickel alloy	Reactor coolant	Cracking due to stress corrosion cracking (for stainless steel or nickel alloy surfaces exposed to reactor coolant only), intergranular stress corrosion cracking (for stainless steel or nickel alloy surfaces exposed to reactor coolant only), thermal, mechanical, vibratory loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," AMP XI.M2, "Water Chemistry," and XI.M35, "One-Time Inspection of ASME Code Class 1 Small-bore Piping"	No
M	IV.C1.R-52	3.1-1, 50	Class 1 piping, piping components, including pump casings	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No
M	IV.C1.R-08	3.1-1, 38	Class 1 valve bodies and bonnets	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections	No

IV REACTOR VESSEL, INTERNALS AND REACTOR COOLANT SYSTEM
Table C1 Reactor Coolant Pressure Boundary (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							IWB, IWC, and IWD." For valve bodies, screening for susceptibility to thermal aging is not necessary. The ASME Section XI inspection requirements are sufficient for managing the effects of loss of fracture toughness due to thermal aging embrittlement of CASS valve bodies.	
	IV.C1.RP-43	3.1-1, 67	Closure bolting	Steel; stainless steel	Air	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
	IV.C1.RP-42	3.1-1, 63	Closure bolting	Steel; stainless steel	Air with reactor coolant leakage	Loss of material due to general (steel only), pitting, crevice corrosion, wear	AMP XI.M18, "Bolting Integrity"	No

IV REACTOR VESSEL, INTERNALS AND REACTOR COOLANT SYSTEM
Table C1 Reactor Coolant Pressure Boundary (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	IV.C1.R-15	3.1-1, 17	Isolation condenser components	Stainless steel	Reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	Yes
M	IV.C1.R-225	3.1-1, 21	Isolation condenser components	Steel; stainless steel	Reactor coolant	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	Yes
M	IV.C1.RP-39	3.1-1, 31	Isolation condenser components	Steel; stainless steel	Reactor coolant	Loss of material due to general (steel only), pitting, crevice corrosion, wear	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No
N	IV.C1.R-450	3.1-1, 134	Jacketed thermal insulation	Any	Air – indoor uncontrolled, air – outdoor environment, air with	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, "External Surfaces Monitoring of Mechanical	No

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
					borated water leakage, air with reactor coolant leakage, air with steam or water leakage		Components"	
N	IV.C1.R-429	3.1-1, 122	Non-ASME Code Class 1 piping, piping components	Steel; stainless steel, nickel alloy; copper alloy	Air – indoor uncontrolled, condensation	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	IV.C1.R-406	3.1-1, 110	Piping, piping components	Any	Reactor Coolant	Wall thinning due to erosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	IV.C1.R-23	3.1-1, 60	Piping, piping components	Steel	Reactor coolant	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
N	IV.C1.R-431	3.1-1, 124	Piping, piping components	Steel; stainless steel, nickel alloy; copper alloy	Condensation	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	IV.C1.R-21	3.1-1, 97	Piping, piping components greater than or equal to 4 NPS	Nickel alloy	Reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	AMP XI.M7, "BWR Stress Corrosion Cracking," and AMP XI.M2, "Water Chemistry"	Yes

IV REACTOR VESSEL, INTERNALS AND REACTOR COOLANT SYSTEM
Table C1 Reactor Coolant Pressure Boundary (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	IV.C1.R-20	3.1-1, 97	Piping, piping components greater than or equal to 4 NPS	Stainless steel	Reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	AMP XI.M7, "BWR Stress Corrosion Cracking," and AMP XI.M2, "Water Chemistry"	Yes
N	IV.C1.R-432	3.1-1, 129	Piping, piping components: Welded connection between the re-routed control rod drive return line and the inlet piping system that delivers return line flow to the reactor pressure vessel	Steel; stainless steel	Reactor coolant	Cracking due to cyclic loading	Plant-specific aging management program	Yes
M	IV.C1.RP-44	3.1-1, 11	Pump and valve closure bolting	Steel; stainless steel	System temperature up to 288°C (550°F)	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
	IV.C1.RP-158	3.1-1, 79	Reactor coolant pressure boundary components	Steel (with stainless steel or nickel-alloy cladding); stainless steel; nickel	Reactor coolant	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

IV REACTOR VESSEL, INTERNALS AND REACTOR COOLANT SYSTEM
Table C1 Reactor Coolant Pressure Boundary (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
				alloy				
M	IV.C1.R-220	3.1-1, 6	Reactor coolant pressure boundary components: piping, piping components; other pressure retaining components with fatigue analyses	Steel (with or without nickel-alloy or stainless steel cladding); stainless steel; nickel alloy	Reactor coolant	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes

C2. REACTOR COOLANT SYSTEM AND CONNECTED LINES (PRESSURIZED WATER REACTOR)

Systems, Structures, and Components

This section addresses the pressurized water reactor (PWR) primary coolant pressure boundary and consists of the reactor coolant system (RCS) and portions of other connected systems generally extending up to and including the second containment isolation valve or to the first anchor point and including the containment isolation valves, the reactor coolant pump (RCP), valves, pressurizer, and the pressurizer relief tank. The connected systems include the residual heat removal (RHR) or low pressure injection (LPI) system, high pressure injection (HPI) system, sampling system, and the small-bore piping. With respect to other systems such as the core flood system (CFS) or the safety injection tank (SIT) and the chemical and volume control system (CVCS), the isolation valves associated with the boundary between American Society of Mechanical Engineers (ASME) Code class 1 and 2 are located inside the containment. Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," and with the exception of the pressurizer relief tank, which is governed by Group B Quality Standards, all systems, structures and components (SSCs) that comprise the RCS are governed by Group A Quality Standards. The recirculating pump seal water heat exchanger is discussed in V.D1.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration, or are subject to replacement based on qualified life or specified time period. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in IV.E.

System Interfaces

The systems that interface with the reactor coolant pressure boundary (RCPB) include the reactor pressure vessel (RPV) (IV.A2), the steam generators (SGs) (IV.D1 and IV.D2), the emergency core cooling system (ECCS) (V.D1), and the CVCS (VII.E1).

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table C2 Reactor Coolant System and Connected Lines (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	IV.C2.R-448	3.1-1, 133	Any	Steel	Reactor coolant, treated water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
M	IV.C2.RP-235	3.1-1, 39	Class 1 piping, fittings and branch connections < NPS 4	Steel (with or without stainless steel or nickel alloy cladding); stainless steel; nickel alloy	Reactor coolant	Cracking due to stress corrosion cracking (for stainless steel or nickel alloy surfaces exposed to reactor coolant only), intergranular stress corrosion cracking (for stainless steel or nickel alloy surfaces exposed to reactor coolant only), thermal, mechanical, vibratory loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," AMP XI.M2, "Water Chemistry," and XI.M35, "One-Time Inspection of ASME Code Class 1 Small-bore Piping"	No
M	IV.C2.R-05	3.1-1, 20	Class 1 piping, piping components	Cast austenitic stainless steel	Reactor coolant	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and plant-specific aging management program	Yes
M	IV.C2.RP-344	3.1-1, 33	Class 1 piping, piping components	Stainless steel; steel with stainless steel cladding	Reactor coolant	Cracking due to stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,"	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table C2 Reactor Coolant System and Connected Lines (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							and AMP XI.M2, "Water Chemistry"	
M	IV.C2.R-52	3.1-1, 50	Class 1 piping, piping components, including pump casings	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No
M	IV.C2.R-09	3.1-1, 33	Class 1 pump casings; valve bodies	Steel (with stainless steel cladding); stainless steel	Reactor coolant	Cracking due to stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No
M	IV.C2.R-08	3.1-1, 38	Class 1 valve bodies and bonnets	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD." For valve bodies, screening for susceptibility	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table C2 Reactor Coolant System and Connected Lines (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							to thermal aging is not necessary. The ASME Section XI inspection requirements are sufficient for managing the effects of loss of fracture toughness due to thermal aging embrittlement of CASS valve bodies.	
	IV.C2.R-11	3.1-1, 62	Closure bolting	High-strength, low-alloy steel; stainless steel	Air with reactor coolant leakage	Cracking due to stress corrosion cracking	AMP XI.M18, "Bolting Integrity"	No
	IV.C2.R-12	3.1-1, 66	Closure bolting	Low-alloy steel, stainless steel	Air with reactor coolant leakage	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
	IV.C2.RP-166	3.1-1, 64	Closure bolting	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.M18, "Bolting Integrity"	No
	IV.C2.RP-167	3.1-1, 49	Closure bolting	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No

IV Table C2	REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM Reactor Coolant System and Connected Lines (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	IV.C2.RP-380	3.1-1, 48	External surfaces: reactor coolant pressure boundary piping or components adjacent to dissimilar metal (Alloy 82/182) welds	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion," and AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs Only)"	No
N	IV.C2.R-450	3.1-1, 134	Jacketed thermal insulation	Any	Air – indoor uncontrolled, air – outdoor environment, air with borated water leakage, air with reactor coolant leakage, air with steam or water leakage	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	IV.C2.R-429	3.1-1, 122	Non-ASME Code Class 1 piping, piping components	Steel; stainless steel, nickel alloy; copper alloy	Air – indoor uncontrolled, condensation	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table C2 Reactor Coolant System and Connected Lines (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	IV.C2.R-18	3.1-1, 5	Piping and components (External surfaces); bolting	Steel; stainless steel	System temperature up to 340°C (644°F)	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	IV.C2.RP-222	3.1-1, 90	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	IV.C2.RP-12	3.1-1, 93	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	IV.C2.RP-159	3.1-1, 45	Piping, piping components	Nickel alloy	Reactor coolant, steam	Cracking due to primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry," and AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table C2 Reactor Coolant System and Connected Lines (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							RCPB Components (PWRs Only)"	
M	IV.C2.RP-221	3.1-1, 89	Piping, piping components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
N	IV.C2.R-431	3.1-1, 124	Piping, piping components	Steel; stainless steel, nickel alloy; copper alloy	Condensation	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	IV.C2.R-17	3.1-1, 49	Piping, piping components: External surfaces	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	IV.C2.RP-23	3.1-1, 88	Piping, piping components; flanges; heater sheaths and sleeves; penetrations; thermal sleeves; vessel shell heads and welds	Steel (with stainless steel or nickel-alloy cladding); stainless steel; nickel alloy	Reactor coolant	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry"	No
M	IV.C2.R-58	3.1-1, 40	Pressurizer components	Steel (with stainless steel or nickel-alloy cladding); stainless steel	Reactor coolant	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC,	No

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							and IWD"	
M	IV.C2.R-25	3.1-1, 42	Pressurizer components	Steel (with stainless steel or nickel-alloy cladding); stainless steel	Reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No
M	IV.C2.R-217	3.1-1, 33	Pressurizer heater sheaths and sleeves; heater bundle diaphragm plate	Stainless steel	Reactor coolant	Cracking due to stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No
M	IV.C2.RP-37	3.1-1, 45	Pressurizer instrumentation penetrations; heater sheaths and sleeves; heater bundle diaphram plate; manways and	Nickel alloy; nickel-alloy cladding	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP	No

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			flanges				XI.M2, "Water Chemistry," and AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs Only)"	
M	IV.C2.RP-231	3.1-1, 34	Pressurizer relief tank: tank shell and heads; flanges; nozzles	Stainless steel; steel with stainless steel cladding	Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No
M	IV.C2.R-13	3.1-1, 5	Pressurizer relief tank: tank shell and heads; flanges; nozzles	Steel (with stainless steel or nickel-alloy cladding)	Treated borated water	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table C2 Reactor Coolant System and Connected Lines (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	IV.C2.RP-383	3.1-1, 80	Pressurizer relief tank: tank shell and heads; flanges; nozzles (non-ASME Section XI components)	Stainless steel; steel with stainless steel cladding	Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	IV.C2.RP-156	3.1-1, 45	Pressurizer surge and steam space nozzles; welds	Nickel alloy	Reactor coolant, steam	Cracking due to primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry," and AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs Only)"	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table C2 Reactor Coolant System and Connected Lines (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	IV.C2.R-19	3.1-1, 36	Pressurizer: integral support	Steel; stainless steel	Air with metal temperature up to 288°C (550°F)	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No
	IV.C2.RP-40	3.1-1, 82	Pressurizer: spray head	Nickel alloy	Reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
	IV.C2.RP-41	3.1-1, 81	Pressurizer: spray head	Stainless Steel	Reactor coolant	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	IV.C2.R-223	3.1-1, 9	Reactor coolant pressure boundary components: piping, piping components; other pressure retaining components with fatigue analyses	Steel (with or without nickel-alloy or stainless steel cladding); stainless steel; nickel alloy	Reactor coolant	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes

IV Table C2	REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM Reactor Coolant System and Connected Lines (PWR)							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	IV.C2.R-56	3.1-1, 35	Reactor coolant system piping and fittings: cold leg; hot leg; surge line; spray line	Steel (with stainless steel cladding); stainless steel	Reactor coolant	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No
M	IV.C2.R-30	3.1-1, 33	Reactor coolant system piping and fittings: cold leg; hot leg; surge line; spray line	Steel (with stainless steel cladding); stainless steel	Reactor coolant	Cracking due to stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No

D1. STEAM GENERATOR (RECIRCULATING)

Systems, Structures, and Components

This section addresses the recirculating-type steam generators (SGs), as found in Westinghouse and Combustion Engineering (CE) pressurized water reactor (PWR), including all internal components and water/steam nozzles and safe ends. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” the primary water side (tube side) of the SG is governed by Group A Quality Standards, and the secondary water side is governed by Group B Quality Standards.

Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in IV.E.

System Interfaces

The systems that interface with the SGs include the reactor coolant system (RCS) and connected lines (IV.C2), the containment isolation components (V.C), the main steam (MS) system (VIII.B1), the feedwater (FW) system (VIII.D1), the SG blowdown system (VIII.F), and the auxiliary feedwater (AFW) system (VIII.G).

IV Table D1	REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM Steam Generator (Recirculation)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	IV.D1.R-448	3.1-1, 133	Any	Steel	Reactor coolant, treated water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
M	IV.D1.R-10	3.1-1, 62	Closure bolting	Steel (high strength alloy steel)	Air with reactor coolant leakage	Cracking due to stress corrosion cracking	AMP XI.M18, "Bolting Integrity"	No
	IV.D1.RP-46	3.1-1, 67	Closure bolting	Steel; stainless steel	Air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
M	IV.D1.RP-36	3.1-1, 45	Instrument penetrations and primary side nozzles; safe ends; welds	Steel (with nickel-alloy cladding); nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry," and AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table D1 Steam Generator (Recirculation)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Only)"	
N	IV.D1.R-450	3.1-1, 134	Jacketed thermal insulation	Any	Air – indoor uncontrolled, air – outdoor environment, air with borated water leakage, air with reactor coolant leakage, air with steam or water leakage	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
	IV.D1.R-37	3.1-1, 61	Pressure boundary and structural: steam nozzle and safe end; feedwater nozzle and safe end	Steel	Secondary feedwater or steam	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
	IV.D1.RP-17	3.1-1, 86	Primary side components: divider plate	Stainless steel	Reactor coolant	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry"	No
M	IV.D1.RP-367	3.1-1, 25	Primary side components: divider plate	Steel (with nickel-alloy cladding); nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M2, "Water Chemistry," and plant-specific aging management program	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table D1 Steam Generator (Recirculation)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	IV.D1.R-17	3.1-1, 49	Recirculating steam generator components: 'External surfaces	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	IV.D1.R-221	3.1-1, 8	Recirculating steam generator components: flanges; penetrations; nozzles; safe ends; lower heads; welds	Steel (with or without nickel-alloy or stainless steel cladding); stainless steel; nickel alloy	Reactor coolant	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
N	IV.D1.R-436	3.1-1, 127	Steam generator channel head	Steel (with stainless steel or nickel alloy cladding)	Reactor coolant	Loss of material due to boric acid corrosion	AMP XI.M2, "Water Chemistry," and a plant-specific program	Yes
	IV.D1.RP-372	3.1-1, 83	Steam generator components: shell assembly	Steel	Secondary feedwater or steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	IV.D1.R-33	3.1-1, 5	Steam generator components: top head; steam nozzle and safe end; upper and	Steel	Secondary feedwater or steam	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table D1 Steam Generator (Recirculation)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			lower shell; feedwater (FW) and auxiliary FW nozzle and safe end; FW impingement plate and support					
M	IV.D1.RP-368	3.1-1, 12	Steam generator components: upper and lower shell; transition cone; new transition cone closure weld	Steel	Secondary feedwater or steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	Yes
M	IV.D1.R-39	3.1-1, 22	Steam generator feedwater impingement plate and support	Steel	Secondary feedwater	Loss of material due to erosion	Plant-specific aging management program	Yes
	IV.D1.RP-48	3.1-1, 75	Steam generator structural: tube support lattice bars	Steel	Secondary feedwater or steam	Wall thinning due to flow-accelerated corrosion, general corrosion	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table D1 Steam Generator (Recirculation)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	IV.D1.R-42	3.1-1, 72	Steam generator structural: tube support plates	Steel	Secondary feedwater or steam	Ligament cracking due to corrosion	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
	IV.D1.RP-384	3.1-1, 71	Steam generator structural: U-bend supports including anti-vibration bars	Steel; chrome plated steel; stainless steel; nickel alloy	Secondary feedwater or steam	Cracking due to stress corrosion cracking or other mechanism(s)	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
M	IV.D1.RP-225	3.1-1, 76	Steam generator structural: U-bend supports including anti-vibration bars	Steel; chrome plated steel; stainless steel; nickel alloy	Secondary feedwater or steam	Loss of material due to fretting, wear	AMP XI.M19, "Steam Generators"	No
	IV.D1.RP-226	3.1-1, 71	Steam generator structural: U-bend supports including anti-vibration bars	Steel; chrome plated steel; stainless steel; nickel alloy	Secondary feedwater or steam	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
M	IV.D1.RP-232	3.1-1, 33	Steam generator: primary nozzles; nozzle-to-safe end	Stainless steel; steel with stainless steel cladding	Reactor coolant	Cracking due to stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections	No

IV Table D1	REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM Steam Generator (Recirculation)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
			welds; manways; flanges				IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	
	IV.D1.RP-161	3.1-1, 72	Steam generator: Tube bundle wrapper and associated supports and mounting hardware	Steel	Secondary feedwater or steam	Loss of material due to erosion, general, pitting, crevice corrosion	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
	IV.D1.R-40	3.1-1, 70	Tube plugs	Nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
	IV.D1.R-43	3.1-1, 68	Tubes	Nickel alloy	Secondary feedwater or steam	Changes in dimension ("denting") due to corrosion of carbon steel tube support plate	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
N	IV.D1.R-407	3.1-1, 111	Tubes	Nickel alloy	Secondary feedwater or steam	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M19, "Steam Generators"	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

Table D1 Steam Generator (Recirculation)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	IV.D1.R-437	3.1-1, 125	Tubes (at tube support plate locations)	Nickel alloy	Secondary feedwater or steam	Cracking due to flow-induced vibration or high-cycle fatigue	AMP XI.M2, "Water Chemistry," and AMP XI.M19, "Steam Generators"	No
M	IV.D1.R-50	3.1-1, 73	Tubes and sleeves	Nickel alloy	Phosphate chemistry in secondary feedwater or steam	Loss of material due to wastage, pitting corrosion	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
	IV.D1.R-44	3.1-1, 70	Tubes and sleeves	Nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
M	IV.D1.R-46	3.1-1, 2	Tubes and sleeves	Nickel alloy	Reactor coolant, secondary feedwater/steam	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
	IV.D1.R-48	3.1-1, 69	Tubes and sleeves	Nickel alloy	Secondary feedwater or steam	Cracking due to intergranular attack	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
	IV.D1.R-47	3.1-1, 69	Tubes and sleeves	Nickel alloy	Secondary feedwater or steam	Cracking due to outer diameter stress corrosion cracking	AMP XI.M19, "Steam Generators," and AMP XI.M2,	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table D1 Steam Generator (Recirculation)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							"Water Chemistry"	
	IV.D1.RP-233	3.1-1, 77	Tubes and sleeves	Nickel alloy	Secondary feedwater or steam	Loss of material due to fretting, wear	AMP XI.M19, "Steam Generators"	No
M	IV.D1.RP-385	3.1-1, 25	Tube-to-tube sheet welds	Nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M2, "Water Chemistry," and plant-specific aging management program	Yes
	IV.D1.RP-49	3.1-1, 74	Upper assembly and separators including: feedwater inlet ring and support	Steel	Secondary feedwater or steam	Wall thinning due to flow-accelerated corrosion	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No

D2. STEAM GENERATOR (ONCE-THROUGH)

Systems, Structures, and Components

This section addresses the once-through type steam generators (SGs), as found in Babcock & Wilcox (B&W) pressurized water reactors (PWRs), including all internal components and water/steam nozzles and safe ends. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” the primary water side (tube side) of the SG is governed by Group A Quality Standards, and the secondary water side is governed by Group B Quality Standards.

Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in IV.E.

System Interfaces

The systems that interface with the SGs include the reactor coolant system (RCS) and connected lines (IV.C2), the main steam (MS) system (VIII.B1), the feedwater (FW) system (VIII.D1), the SG blowdown system (VIII.F), and the auxiliary feedwater (AFW) system (VIII.G).

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table D2 Steam Generator (Once-Through)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	IV.D2.R-448	3.1-1, 133	Any	Steel	Reactor coolant, treated water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
	IV.D2.RP-46	3.1-1, 67	Closure bolting	Steel; stainless steel	Air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
M	IV.D2.RP-36	3.1-1, 45	Instrument penetrations and primary side nozzles; safe ends; welds	Steel (with nickel-alloy cladding); nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry," and AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs Only)"	No

IV Table D2	REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM Steam Generator (Once-Through)							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	IV.D2.R-450	3.1-1, 134	Jacketed thermal insulation	Any	Air – indoor uncontrolled, air – outdoor environment, air with borated water leakage, air with reactor coolant leakage, air with steam or water leakage	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	IV.D2.R-17	3.1-1, 49	Once-through steam generator components: 'External surfaces	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	IV.D2.R-222	3.1-1, 8	Once-through steam generator components: primary side nozzles, safe ends, welds	Steel (with or without nickel-alloy or stainless steel cladding); stainless steel; nickel alloy	Reactor coolant	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	IV.D2.RP-47	3.1-1, 42	Primary side components: upper and lower heads, and tube sheet welds	Steel (with stainless steel or nickel-alloy cladding)	Reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table D2 Steam Generator (Once-Through)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Chemistry"	
M	IV.D2.R-31	3.1-1, 44	Secondary manway covers; handhole covers	Steel	Air with leaking secondary-side water and/or steam	Loss of material due to erosion	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No
	IV.D2.R-36	3.1-1, 78	Steam generator components: secondary side nozzles (vent, drain, and instrumentation)	Nickel alloy	Secondary feedwater or steam	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection," or AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."	No
	IV.D2.R-38	3.1-1, 61	Steam generator components: feedwater (FW) and auxiliary FW nozzles and safe ends; steam nozzles	Steel	Secondary feedwater or steam	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table D2 Steam Generator (Once-Through)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			and safe ends					
	IV.D2.RP-153	3.1-1, 83	Steam generator components: shell assembly	Steel	Secondary feedwater or steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	IV.D2.R-33	3.1-1, 5	Steam generator components: top head; steam nozzle and safe end; upper and lower shell; feedwater (FW) and auxiliary FW nozzle and safe end; FW impingement plate and support	Steel	Secondary feedwater or steam	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
	IV.D2.R-42	3.1-1, 72	Steam generator structural: tube support plates	Steel	Secondary feedwater or steam	Ligament cracking due to corrosion	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
N	IV.D2.R-440	3.1-1, 127	Steam Generator upper and	Steel (with stainless steel or	Reactor coolant	Loss of material due to boric acid corrosion	AMP XI.M2, "Water Chemistry,"	Yes

IV Table D2 — REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Steam Generator (Once-Through)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			lower heads	nickel alloy cladding)			and plant-specific aging management program	
	IV.D2.RP-162	3.1-1, 72	Steam generator: tube bundle wrapper and associated supports and mounting hardware	Steel	Secondary feedwater or steam	Loss of material due to erosion, general, pitting, crevice corrosion	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
	IV.D2.R-40	3.1-1, 70	Tube plugs	Nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
	IV.D2.R-226	3.1-1, 68	Tubes	Nickel alloy	Secondary feedwater or steam	Changes in dimension ("denting") due to corrosion of carbon steel tube support plate	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
N	IV.D2.R-407	3.1-1, 111	Tubes	Nickel alloy	Secondary feedwater or steam	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M19, "Steam Generators"	No
N	IV.D2.R-442	3.1-1, 125	Tubes (at tube support plate locations)	Nickel alloy	Secondary feedwater or steam	Cracking due to flow-induced vibration or high-cycle fatigue	AMP XI.M2, "Water Chemistry," and AMP	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table D2 Steam Generator (Once-Through)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							XI.M19, "Steam Generators"	
	IV.D2.R-44	3.1-1, 70	Tubes and sleeves	Nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
M	IV.D2.R-46	3.1-1, 2	Tubes and sleeves	Nickel alloy	Reactor coolant, secondary feedwater/steam	Cumulative fatigue damage: cracking due to fatigue, cyclical loading	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
	IV.D2.R-48	3.1-1, 69	Tubes and sleeves	Nickel alloy	Secondary feedwater or steam	Cracking due to intergranular attack	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
	IV.D2.R-47	3.1-1, 69	Tubes and sleeves	Nickel alloy	Secondary feedwater or steam	Cracking due to outer diameter stress corrosion cracking	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No
	IV.D2.RP-233	3.1-1, 77	Tubes and sleeves	Nickel alloy	Secondary feedwater or steam	Loss of material due to fretting, wear	AMP XI.M19, "Steam Generators"	No

IV Table D2	REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM Steam Generator (Once-Through)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	IV.D2.RP-185	3.1-1, 25	Tube-to-tube sheet welds	Nickel alloy	Reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M2, "Water Chemistry," and plant-specific aging management program	Yes

E. COMMON MISCELLANEOUS MATERIAL/ENVIRONMENT COMBINATIONS

Systems, Structures, and Components

This section addresses the aging management programs (AMPs) for miscellaneous material/environment combinations which may be found throughout the reactor vessel, internals and reactor coolant systems, structures, and components (SSCs). For the material/environment combinations in this part, aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation. With the exception of components within the scope of American Society of Mechanical Engineers (ASME) Section XI, no AMPs for these structures and components (SCs) are required.

System Interfaces

The structures and components covered in this section belong to the engineered safety features in pressurized water reactors (PWRs) and boiling water reactors (BWRs). (For example, see System Interfaces in V.A to V.D2 for details.)

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

Table E. Common Miscellaneous Material/Environment Combinations

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	IV.E.RP-03	3.1-1, 106	Piping, piping components	Nickel alloy	Air – indoor uncontrolled (external)	None	None	No
M	IV.E.RP-378	3.1-1, 106	Piping, piping components	Nickel alloy	Air with borated water leakage	None	None	No
M	IV.E.RP-04	3.1-1, 107	Piping, piping components	Stainless steel	Air – indoor uncontrolled (external)	None	None	No
M	IV.E.RP-05	3.1-1, 107	Piping, piping components	Stainless steel	Air with borated water leakage	None	None	No
M	IV.E.RP-06	3.1-1, 115	Piping, piping components	Stainless steel	Concrete	None	None	Yes
M	IV.E.RP-07	3.1-1, 107	Piping, piping components	Stainless steel	Gas	None	None	No
M	IV.E.RP-353	3.1-1, 105	Piping, piping components	Steel	Concrete	None	None	Yes
N	IV.E.R-444	3.1-1, 114	Reactor coolant system components: Components defined as ASME Section XI components (e.g., reactor coolant	Any	Applicable internal or external environment	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking (stainless steel or nickel alloy components only), cyclical loading; loss of material due to general	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No

IV REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM
Table E. Common Miscellaneous Material/Environment Combinations

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			pressure boundary components, core support structure components, ASME Class 2 or 3 components, including associated pressure-retaining welds) not managed by other AMR line items in GALL-SLR Chapter IV			corrosion (steel only), pitting corrosion, crevice corrosion, wear		

CHAPTER V

ENGINEERED SAFETY FEATURES

V ENGINEERED SAFETY FEATURES

A. CONTAINMENT SPRAY SYSTEM (PRESSURIZED WATER REACTORS)

B. STANDBY GAS TREATMENT SYSTEM (BOILING WATER REACTORS)

C. CONTAINMENT ISOLATION COMPONENTS

D1. EMERGENCY CORE COOLING SYSTEM (PRESSURIZED WATER REACTORS)

D2. EMERGENCY CORE COOLING SYSTEM (BOILING WATER REACTORS)

E. EXTERNAL SURFACES OF COMPONENTS AND MISCELLANEOUS BOLTING.

F. COMMON MISCELLANEOUS MATERIAL/ENVIRONMENT COMBINATIONS.

A. CONTAINMENT SPRAY SYSTEM (PRESSURIZED WATER REACTORS)

Systems, Structures, and Components

This section addresses the containment spray system for pressurized water reactors (PWRs) designed to lower the pressure, temperature, and gaseous radioactivity (iodine) content of the containment atmosphere following a design basis event. Spray systems using chemically treated borated water are reviewed. The system consists of piping and valves, including containment isolation valves, flow elements, orifices, pumps, spray nozzles, eductors, and the containment spray system heat exchanger (for some plants).

Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the containment spray system outside or inside the containment are governed by Group B Quality Standards.

Pumps and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in V.E. Common miscellaneous material/environment combinations, where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation, are included in V.F.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the containment spray system are the PWR emergency core cooling (V.D1), and open- or closed-cycle cooling water (CCCW) systems (VII.C1 or VII.C2).

V ENGINEERED SAFETY FEATURES
Table A Containment Spray system (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	V.A.E-434	3.2-1, 90	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
N	V.A.E-421	3.2-1, 79	Bolting	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
	V.A.E-26	3.2-1, 40	Ducting, piping, and components (External surfaces)	Steel	Air – indoor uncontrolled (external)	Loss of material due to general corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
	V.A.EP-42	3.2-1, 45	Encapsulation components	Steel	Air – indoor uncontrolled (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	V.A.EP-43	3.2-1, 47	Encapsulation components	Steel	Air with borated water leakage (Internal)	Loss of material due to general, pitting, crevice, and boric acid corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

V ENGINEERED SAFETY FEATURES
Table A Containment Spray system (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	V.A.E-28	3.2-1, 9	External surfaces	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	V.A.EP-94	3.2-1, 32	Heat exchanger components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.A.EP-37	3.2-1, 34	Heat exchanger components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	V.A.EP-93	3.2-1, 31	Heat exchanger components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.A.EP-91	3.2-1, 25	Heat exchanger components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	V.A.EP-92	3.2-1, 30	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.A.EP-90	3.2-1, 23	Heat exchanger components	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow	AMP XI.M20, "Open-Cycle Cooling Water System"	No

V ENGINEERED SAFETY FEATURES
Table A Containment Spray system (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						blockage due to fouling		
N	V.A.E-435	3.2-1, 92	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air, condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	V.A.EP-100	3.2-1, 33	Heat exchanger tubes	Copper alloy	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
	V.A.EP-78	3.2-1, 51	Heat exchanger tubes	Copper alloy	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
	V.A.EP-96	3.2-1, 33	Heat exchanger tubes	Stainless steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
	V.A.EP-79	3.2-1, 51	Heat exchanger tubes	Stainless steel	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No

V Table A	ENGINEERED SAFETY FEATURES Containment Spray system (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	V.A.E-21	3.2-1, 27	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
	V.A.E-20	3.2-1, 19	Heat exchanger tubes	Stainless steel	Treated borated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
	V.A.EP-75	3.2-1, 51	Heat exchanger tubes	Steel	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	V.A.E-43	3.2-1, 35	Motor cooler	Gray cast iron	Treated water, closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
	V.A.E-29	3.2-1, 44	Piping and components (Internal surfaces)	Steel	Air – indoor uncontrolled (internal)	Loss of material due to general corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	V.A.E-415	3.2-1, 74	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping	No

V Table A	ENGINEERED SAFETY FEATURES Containment Spray system (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
							Components, Heat Exchangers, and Tanks"	
N	V.A.E-443	3.2-1, 100	Piping, piping components	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	V.A.EP-97	3.2-1, 32	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.A.EP-76	3.2-1, 50	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	V.A.EP-27	3.2-1, 34	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	V.A.EP-95	3.2-1, 31	Piping, piping components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No

V Table A	ENGINEERED SAFETY FEATURES Containment Spray system (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	V.A.EP-98	3.2-1, 28	Piping, piping components	Stainless steel	Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No
N	V.A.E-420	3.2-1, 78	Piping, piping components	Stainless steel, aluminum	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	V.A.EP-77	3.2-1, 49	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	V.A.EP-81	3.2-1, 48	Piping, piping components (internal surfaces); tanks	Stainless steel	Condensation (internal)	Loss of material due to pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	V.A.E-428	3.2-1, 85	Piping, piping components, heat exchanger components	Nickel alloy	Treated water, treated borated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	V.A.E-401	3.2-1, 72	Piping, piping components, heat exchangers, tanks with	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling,	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping	No

V ENGINEERED SAFETY FEATURES
Table A Containment Spray system (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			internal coatings/linings		borated water, lubricating oil	delamination, rusting, physical damage, spalling for cementitious coatings/linings	Components, Heat Exchangers, and Tanks"	
M	V.A.E-414	3.2-1, 73	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	V.A.E-400	3.2-1, 66	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	V.A.EP-41	3.2-1, 22	Piping, piping components; tanks	Stainless steel	Treated borated water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	V.A.E-12	3.2-1, 20	Piping, piping components; tanks	Stainless steel	Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

V Table A	ENGINEERED SAFETY FEATURES Containment Spray system (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	V.A.E-427	3.2-1, 84	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	V.A.E-404	3.2-1, 70	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel, stainless steel, aluminum	Treated water, treated borated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC (steel and stainless steel only)	AMP XI.M29, "Aboveground Metallic Tanks"	No
D	V.A.E-403							
D	V.A.E-406							

B. STANDBY GAS TREATMENT SYSTEM (BOILING WATER REACTORS)

Systems, Structures, and Components

This section addresses the standby gas treatment system found in boiling water reactors (BWRs) and consists of ductwork, filters, and fans. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the standby gas treatment system are governed by Group B Quality Standards.

Specifically, charcoal absorber filters are to be addressed consistent with the U.S. Nuclear Regulatory Commission (NRC) position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of Nuclear Energy Institute (NEI), dated March 10, 2000. Components that function as system filters are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, from an aging management review (AMR) (on a plant-specific basis), under 10 CFR 54.21(a)(1)(ii). As part of the methodology description, the application should identify the standards that are relied on for replacement, for example, National Fire Protection Association (NFPA) standards for fire protection equipment.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in V.E. Common miscellaneous material/environment combinations, where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation, are included in V.F.

System Interfaces

There are no system interfaces with the standby gas treatment system addressed in this section.

V ENGINEERED SAFEY FEATURES
Table B Standby Gas Treatment System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	V.B.E-434	3.2-1, 90	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
	V.B.E-25	3.2-1, 44	Ducting and components (Internal surfaces)	Steel	Air – indoor uncontrolled (internal)	Loss of material due to general corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	V.B.E-40	3.2-1, 40	Ducting, closure bolting	Steel	Air – indoor uncontrolled (external)	Loss of material due to general corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
	V.B.E-26	3.2-1, 40	Ducting, piping, components (External surfaces)	Steel	Air – indoor uncontrolled (external)	Loss of material due to general corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	V.B.EP-37	3.2-1, 34	Heat exchanger components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	V.B.E-435	3.2-1, 92	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air, condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

V ENGINEERED SAFEY FEATURES
Table B Standby Gas Treatment System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.B.E-415	3.2-1, 74	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	V.B.E-443	3.2-1, 100	Piping, piping components	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	V.B.EP-97	3.2-1, 32	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.B.EP-27	3.2-1, 34	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	V.B.EP-54	3.2-1, 37	Piping, piping components	Gray cast iron	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	V.B.EP-103	3.2-1, 7	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes

V ENGINEERED SAFEY FEATURES
Table B Standby Gas Treatment System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.B.EP-107	3.2-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	V.B.EP-111	3.2-1, 52	Piping, piping components	Steel (with coating or wrapping)	Soil, concrete	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	V.B.E-401	3.2-1, 72	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	V.B.E-414	3.2-1, 73	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	V.B.E-400	3.2-1, 66	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes

V Table B	ENGINEERED SAFEY FEATURES Standby Gas Treatment System (BWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	V.B.E-427	3.2-1, 84	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	V.B.EP-59	3.2-1, 38	Seals, piping, piping components	Elastomer	Air – indoor uncontrolled (external)	Hardening and loss of strength due to elastomer degradation	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	V.B.EP-58	3.2-1, 43	Seals, piping, piping components	Elastomer	Air – indoor uncontrolled (internal)	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	V.B.E-453	3.2-1, 110	Underground piping, piping components, tanks	Aluminum	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
N	V.B.E-423	3.2-1, 80	Underground piping, piping components; tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	V.B.E-403							

V ENGINEERED SAFEY FEATURES
Table B Standby Gas Treatment System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	V.B.E-406							

C. CONTAINMENT ISOLATION COMPONENTS

Systems, Structures, and Components

This section addresses the containment isolation components found in all designs of boiling water reactors (BWRs) and pressurized water reactors (PWRs) in the United States. The system consists of isolation barriers in lines for BWR and PWR nonsafety systems, such as the plant heating, waste gas, plant drain, liquid waste, and cooling water systems. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the containment isolation components are governed by Group A or B Quality Standards.

The aging management programs (AMPs) for hatchways, hatch doors, penetration sleeves, penetration bellows, seals, gaskets, and anchors are addressed in II.A and II.B. The containment isolation valves for in-scope systems are addressed in the appropriate sections in IV, VII, and VIII.

The AMPs for the degradation of external surfaces of components and miscellaneous bolting are included in V.E. Common miscellaneous material/environment combinations, where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation, are included in V.F.

System Interfaces

There are no system interfaces with the containment isolation components addressed in this section.

V ENGINEERED SAFETY FEATURES
Table C Containment Isolation Components

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	V.C.E-434	3.2-1, 90	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
	V.C.E-35	3.2-1, 40	Containment isolation piping and components (External surfaces)	Steel	Air – indoor uncontrolled (external)	Loss of material due to general corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	V.C.E-34	3.2-1, 25	Containment isolation piping and components (Internal surfaces)	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	V.C.EP-63	3.2-1, 18	Containment isolation piping and components (Internal surfaces)	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	V.C.E-22	3.2-1, 23	Containment isolation piping and components (Internal surfaces)	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	V.C.EP-62	3.2-1, 16	Containment isolation piping and components (Internal	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time	No

V Table C	ENGINEERED SAFETY FEATURES Containment Isolation Components							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
			surfaces)				Inspection"	
M	V.C.E-415	3.2-1, 74	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	V.C.EP-103	3.2-1, 7	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	V.C.EP-107	3.2-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	V.C.EP-95	3.2-1, 31	Piping, piping components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.C.EP-98	3.2-1, 28	Piping, piping components	Stainless steel	Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No

V ENGINEERED SAFETY FEATURES
Table C Containment Isolation Components

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.C.EP-99	3.2-1, 29	Piping, piping components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.C.E-401	3.2-1, 72	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	V.C.E-414	3.2-1, 73	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	V.C.E-400	3.2-1, 66	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	V.C.E-453	3.2-1, 110	Underground piping, piping components, tanks	Aluminum	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
N	V.C.E-423	3.2-1, 80	Underground piping, piping components; tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes

V Table C	ENGINEERED SAFETY FEATURES Containment Isolation Components							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	V.C.E-30							
D	V.C.E-403							
D	V.C.E-406							

D1. EMERGENCY CORE COOLING SYSTEM (PRESSURIZED WATER REACTORS)

Systems, Structures, and Components

This section addresses the emergency core cooling systems for pressurized water reactors (PWRs) designed to cool the reactor core and provide safe shutdown following a design basis accident. The core cooling systems consist of the core flood system (CFS), residual heat removal (RHR) [or shutdown cooling (SDC)], high-pressure safety injection (HPSI), low-pressure safety injection (LPSI), and spent fuel pool (SFP) cooling systems, the lines to the chemical and volume control system (CVCS), the emergency sump, the HPSI and LPSI pumps, the pump seal coolers, the RHR heat exchanger, and the refueling water tank (RWT).

Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications, and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components that comprise the emergency core cooling system are governed by Group B Quality Standards. Portions of the RHR, HPSI, and LPSI systems and the CVCS extending from the reactor coolant system (RCS) up to and including the second containment isolation valve are governed by Group A Quality Standards and covered in IV.C2.

Pumps and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in V.E. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VI.F.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the emergency core cooling system include the RCS and connected lines (IV.C2), the containment spray system (V.A), the spent fuel pool (SFP) cooling and cleanup system (VII.A3), the closed-cycle cooling water (CCCW) system (VII.C2), the ultimate heat sink (UHS) (VII.C3), the CVCS (VII.E1), and the open-cycle cooling water (service water system) (VII.C1).

V ENGINEERED SAFETY FEATURES
Table D1 Emergency Core Cooling System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	V.D1.E-434	3.2-1, 90	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
N	V.D1.E-421	3.2-1, 79	Bolting	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
	V.D1.E-28	3.2-1, 9	External surfaces	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	V.D1.EP-94	3.2-1, 32	Heat exchanger components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.D1.EP-37	3.2-1, 34	Heat exchanger components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	V.D1.EP-93	3.2-1, 31	Heat exchanger components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.D1.EP-91	3.2-1, 25	Heat exchanger components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	V.D1.EP-92	3.2-1, 30	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No

V ENGINEERED SAFETY FEATURES
Table D1 Emergency Core Cooling System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.D1.EP-90	3.2-1, 23	Heat exchanger components	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
N	V.D1.E-435	3.2-1, 92	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air, condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	V.D1.EP-78	3.2-1, 51	Heat exchanger tubes	Copper alloy	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
	V.D1.EP-96	3.2-1, 33	Heat exchanger tubes	Stainless steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
	V.D1.EP-79	3.2-1, 51	Heat exchanger tubes	Stainless steel	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
	V.D1.E-21	3.2-1, 27	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No

V Table D1	ENGINEERED SAFETY FEATURES Emergency Core Cooling System (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	V.D1.E-20	3.2-1, 19	Heat exchanger tubes	Stainless steel	Treated borated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
	V.D1.EP-75	3.2-1, 51	Heat exchanger tubes	Steel	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	V.D1.E-43	3.2-1, 35	Motor cooler	Gray cast iron	Treated water, closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	V.D1.E-24	3.2-1, 5	Orifice (miniflow recirculation)	Stainless steel	Treated borated water	Loss of material due to erosion	Plant-specific aging management program	Yes
M	V.D1.E-415	3.2-1, 74	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	V.D1.E-443	3.2-1, 100	Piping, piping components	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting	Yes

V ENGINEERED SAFETY FEATURES
Table D1 Emergency Core Cooling System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components"	
M	V.D1.EP-101	3.2-1, 8	Piping, piping components	Aluminum	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	V.D1.E-407	3.2-1, 65	Piping, piping components	Any	Treated borated water	Wall thinning due to erosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	V.D1.E-47	3.2-1, 10	Piping, piping components	Cast austenitic stainless steel	Treated borated water >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No
M	V.D1.EP-97	3.2-1, 32	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.D1.EP-76	3.2-1, 50	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	V.D1.EP-27	3.2-1, 34	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	V.D1.E-441	3.2-1, 98	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No

V ENGINEERED SAFETY FEATURES
Table D1 Emergency Core Cooling System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.D1.EP-52	3.2-1, 36	Piping, piping components	Gray cast iron	Closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	V.D1.EP-54	3.2-1, 37	Piping, piping components	Gray cast iron	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	V.D1.EP-103	3.2-1, 7	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	V.D1.EP-107	3.2-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	V.D1.EP-95	3.2-1, 31	Piping, piping components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.D1.EP-98	3.2-1, 28	Piping, piping components	Stainless steel	Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.D1.EP-80	3.2-1, 50	Piping, piping components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No

V Table D1 — ENGINEERED SAFETY FEATURES
Emergency Core Cooling System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.D1.EP-55	3.2-1, 24	Piping, piping components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	V.D1.E-13	3.2-1, 1	Piping, piping components	Stainless steel	Treated borated water	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
N	V.D1.E-420	3.2-1, 78	Piping, piping components	Stainless steel, aluminum	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	V.D1.EP-72	3.2-1, 53	Piping, piping components	Stainless steel, nickel alloy	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	V.D1.EP-77	3.2-1, 49	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
N	V.D1.E-439	3.2-1, 96	Piping, piping components (for components not covered by NRC GL 89-13)	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

V ENGINEERED SAFETY FEATURES
Table D1 Emergency Core Cooling System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.D1.EP-81	3.2-1, 48	Piping, piping components (internal surfaces); tanks	Stainless steel	Condensation (internal)	Loss of material due to pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	V.D1.E-428	3.2-1, 85	Piping, piping components, heat exchanger components	Nickel alloy	Treated water, treated borated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	V.D1.E-401	3.2-1, 72	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	V.D1.E-414	3.2-1, 73	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	V.D1.E-400	3.2-1, 66	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes

V ENGINEERED SAFETY FEATURES
Table D1 Emergency Core Cooling System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.D1.EP-41	3.2-1, 22	Piping, piping components; tanks	Stainless steel	Treated borated water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	V.D1.E-12	3.2-1, 20	Piping, piping components; tanks	Stainless steel	Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
	V.D1.E-38	3.2-1, 21	Safety injection tank (accumulator)	Steel (with stainless steel or nickel-alloy cladding)	Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	V.D1.E-427	3.2-1, 84	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	V.D1.E-448	3.2-1, 105	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Air (external)	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes
N	V.D1.E-447	3.2-1, 104	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	No

V ENGINEERED SAFETY FEATURES
Table D1 Emergency Core Cooling System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	V.D1.E-445	3.2-1, 102	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	The following external environments: soil, concrete, air – outdoor, air – indoor uncontrolled, air – indoor controlled, condensation, raw water, waste water	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	V.D1.E-449	3.2-1, 106	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air – indoor uncontrolled, moist air, condensation, air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	V.D1.E-446	3.2-1, 103	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air – outdoor, air – indoor uncontrolled, air – indoor controlled, moist air, condensation	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
M	V.D1.E-405	3.2-1, 67	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	No
M	V.D1.E-402	3.2-1, 68	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel	Soil, concrete, air – outdoor, air – indoor uncontrolled, moist air, condensation	Loss of material due to general, pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M29, "Aboveground Metallic Tanks"	No

V ENGINEERED SAFETY FEATURES
Table D1 Emergency Core Cooling System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.D1.E-404	3.2-1, 70	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel, stainless steel, aluminum	Treated water, treated borated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC (steel and stainless steel only)	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	V.D1.E-453	3.2-1, 110	Underground piping, piping components, tanks	Aluminum	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
N	V.D1.E-423	3.2-1, 80	Underground piping, piping components; tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	V.D1.E-01							
D	V.D1.E-403							
D	V.D1.E-406							
D	V.D1.EP-49							

D2. EMERGENCY CORE COOLING SYSTEM (BOILING WATER REACTORS)

Systems, Structures, and Components

This section addresses the emergency core cooling systems for boiling water reactors (BWRs) designed to cool the reactor core and provide safe shutdown following a design basis accident. The cooling systems consist of the high-pressure coolant injection (HPCI), reactor core isolation cooling (RCIC), high-pressure core spray (HPCS), automatic depressurization, low-pressure core spray (LPCS), low-pressure coolant injection (LPCI), and residual heat removal (RHR) systems, including various pumps and valves, the RHR heat exchangers, and the drywell and suppression chamber spray system (DSCSS). The auxiliary area ventilation system includes RCIC, HPCI, RHR, and core spray pump room cooling.

Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components that comprise the emergency core cooling system outside the containment are governed by Group B Quality Standards and the portion of the DSCSS inside the containment up to the isolation valve is governed by Group A Quality Standards. Portions of the HPCI, RCIC, HPCS, LPCS, and LPCI (or RHR) systems extending from the reactor vessel up to and including the second containment isolation valve are governed by Group A Quality Standards and covered in IV.C1.

Pumps and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The system piping includes all pipe sizes, including instrument piping.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in V.E. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VI.F.

System Interfaces

The systems that interface with the emergency core cooling system include the reactor vessel (IV.A1), the reactor coolant pressure boundary (RCPB) (IV.C1), the feedwater (FW) system (VIII.D2), the condensate system (VIII.E), the closed-cycle cooling water (CCCW) system (VII.C2), the open-cycle cooling water (OCCW) system (VII.C1), and the ultimate heat sink (UHS) (VII.C3).

V ENGINEERED SAFETY FEATURES
Table D2 Emergency Core Cooling System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	V.D2.E-434	3.2-1, 90	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
N	V.D2.E-421	3.2-1, 79	Bolting	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	V.D2.EP-113	3.2-1, 6	Drywell and suppression chamber spray system (internal surfaces): flow orifice; spray nozzles	Steel	Air – indoor uncontrolled (internal)	Loss of material due to general corrosion; fouling that leads to corrosion	Plant-specific aging management program	Yes
	V.D2.E-26	3.2-1, 40	Ducting, piping, components (External surfaces)	Steel	Air – indoor uncontrolled (external)	Loss of material due to general corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	V.D2.EP-94	3.2-1, 32	Heat exchanger components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.D2.EP-37	3.2-1, 34	Heat exchanger components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	V.D2.EP-93	3.2-1, 31	Heat exchanger components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No

V Table D2	ENGINEERED SAFETY FEATURES Emergency Core Cooling System (BWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	V.D2.EP-91	3.2-1, 25	Heat exchanger components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	V.D2.EP-92	3.2-1, 30	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.D2.EP-90	3.2-1, 23	Heat exchanger components	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
N	V.D2.E-435	3.2-1, 92	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air, condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	V.D2.EP-78	3.2-1, 51	Heat exchanger tubes	Copper alloy	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	V.D2.EP-96	3.2-1, 33	Heat exchanger tubes	Stainless steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
	V.D2.EP-79	3.2-1, 51	Heat exchanger tubes	Stainless steel	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
	V.D2.E-21	3.2-1, 26	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
	V.D2.EP-74	3.2-1, 19	Heat exchanger tubes	Stainless steel	Treated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
	V.D2.EP-75	3.2-1, 51	Heat exchanger tubes	Steel	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
	V.D2.E-23	3.2-1, 27	Heat exchanger tubes	Steel	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
	V.D2.E-29	3.2-1, 44	Piping and components (Internal surfaces)	Steel	Air – indoor uncontrolled (internal)	Loss of material due to general corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and	No

V ENGINEERED SAFETY FEATURES
Table D2 Emergency Core Cooling System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Ducting Components"	
	V.D2.E-27	3.2-1, 46	Piping and components (Internal surfaces)	Steel	Condensation (Internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	V.D2.E-415	3.2-1, 74	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	V.D2.E-443	3.2-1, 100	Piping, piping components	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	V.D2.EP-71	3.2-1, 17	Piping, piping components	Aluminum	Treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.D2.E-408	3.2-1, 65	Piping, Piping components	Any	Treated water	Wall thinning due to erosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	V.D2.E-11	3.2-1, 10	Piping, piping components	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No
M	V.D2.EP-97	3.2-1, 32	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.D2.EP-76	3.2-1, 50	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	V.D2.EP-27	3.2-1, 34	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	V.D2.E-441	3.2-1, 98	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	V.D2.EP-54	3.2-1, 37	Piping, piping components	Gray cast iron	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	V.D2.EP-103	3.2-1, 7	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical	Yes

V ENGINEERED SAFETY FEATURES
Table D2 Emergency Core Cooling System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components"	
M	V.D2.EP-107	3.2-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	V.D2.EP-95	3.2-1, 31	Piping, piping components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.D2.EP-98	3.2-1, 28	Piping, piping components	Stainless steel	Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No
M	V.D2.EP-73	3.2-1, 17	Piping, piping components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	V.D2.E-37	3.2-1, 54	Piping, piping components	Stainless steel	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	AMP XI.M7, "BWR Stress Corrosion Cracking," and AMP XI.M2, "Water Chemistry"	Yes
N	V.D2.E-420	3.2-1, 78	Piping, piping components	Stainless steel, aluminum	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No

V ENGINEERED SAFETY FEATURES
Table D2 Emergency Core Cooling System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.D2.EP-72	3.2-1, 53	Piping, piping components	Stainless steel, nickel alloy	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	V.D2.EP-77	3.2-1, 49	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	V.D2.E-07	3.2-1, 11	Piping, piping components	Steel	Steam	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	V.D2.E-10	3.2-1, 1	Piping, piping components	Steel	Treated water	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	V.D2.EP-60	3.2-1, 16	Piping, piping components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	V.D2.E-09	3.2-1, 11	Piping, piping components	Steel	Treated water	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
N	V.D2.E-440	3.2-1, 97	Piping, piping components (for components not covered by NRC GL 89-13)	Steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting	No

V ENGINEERED SAFETY FEATURES
Table D2 Emergency Core Cooling System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components"	
M	V.D2.EP-61	3.2-1, 48	Piping, piping components (internal surfaces)	Stainless steel	Condensation (internal)	Loss of material due to pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	V.D2.E-428	3.2-1, 85	Piping, piping components, heat exchanger components	Nickel alloy	Treated water, treated borated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	V.D2.E-401	3.2-1, 72	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	V.D2.E-414	3.2-1, 73	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No

V ENGINEERED SAFETY FEATURES
Table D2 Emergency Core Cooling System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.D2.E-400	3.2-1, 66	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	V.D2.E-427	3.2-1, 84	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	V.D2.E-448	3.2-1, 105	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Air (external)	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes
N	V.D2.E-447	3.2-1, 104	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	V.D2.E-445	3.2-1, 102	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	The following external environments: soil, concrete, air – outdoor, air – indoor uncontrolled, air – indoor controlled, condensation, raw water, waste water	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes

V ENGINEERED SAFETY FEATURES
Table D2 Emergency Core Cooling System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	V.D2.E-449	3.2-1, 106	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air – indoor uncontrolled, moist air, condensation, air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	V.D2.E-446	3.2-1, 103	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air – outdoor, air – indoor uncontrolled, air – indoor controlled, moist air, condensation	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
M	V.D2.E-405	3.2-1, 67	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	No
M	V.D2.E-402	3.2-1, 68	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel	Soil, concrete, air – outdoor, air – indoor uncontrolled, moist air, condensation	Loss of material due to general, pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M29, "Aboveground Metallic Tanks"	No
M	V.D2.E-404	3.2-1, 70	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel, stainless steel, aluminum	Treated water, treated borated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC (steel and stainless steel only)	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	V.D2.E-453	3.2-1, 110	Underground piping, piping components, tanks	Aluminum	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes

V	**ENGINEERED SAFETY FEATURES**							
Table D2	**Emergency Core Cooling System (BWR)**							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	V.D2.E-423	3.2-1, 80	Underground piping, piping components; tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	V.D2.E-403							
D	V.D2.E-406							

E. EXTERNAL SURFACES OF COMPONENTS AND MISCELLANEOUS BOLTING

Systems, Structures, and Components

This section addresses the aging management programs (AMPs) for the degradation of external surfaces of structures and components, including closure boltings in the engineered safety features in pressurized water reactors (PWRs) and boiling water reactors (BWRs). For the steel components in PWRs, this section addresses only boric acid corrosion of external surfaces as a result of dripping borated water leaking from an adjacent PWR component. Boric acid corrosion can also occur for steel components containing borated water leaking from an adjacent PWR component. Boric acid corrosion can also occur for steel components containing borated water due to leakage, such components and the related AMP are covered in the appropriate major plant sections in V.

System Interfaces

The structures and components (SCs) covered in this section belong to the engineered safety features in PWRs and BWRs. (For example, see System Interfaces in V.A to V.D2 for details.)

V — ENGINEERED SAFETY FEATURES

Table E — External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	V.E.EP-116	3.2-1, 15	Bolting	Copper alloy	Any environment	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	V.E.E-418	3.2-1, 76	Bolting	Copper alloy	Raw water, waste water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M18, "Bolting Integrity"	No
	V.E.EP-117	3.2-1, 15	Bolting	Nickel alloy	Any environment	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	V.E.E-430	3.2-1, 86	Bolting	Stainless steel	Treated borated water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M18, "Bolting Integrity"	No
	V.E.EP-120	3.2-1, 15	Bolting	Stainless steel	Treated borated water	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
	V.E.E-41	3.2-1, 9	Bolting	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
N	V.E.E-419	3.2-1, 77	Bolting	Steel	Fuel oil, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M18, "Bolting Integrity"	No
	V.E.EP-64	3.2-1, 13	Bolting	Steel; stainless steel	Air – outdoor (External)	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M18, "Bolting Integrity"	No

V ENGINEERED SAFETY FEATURES
Table E External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	V.E.EP-118	3.2-1, 15	Bolting	Steel; stainless steel	Air – outdoor (External)	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	V.E.E-416	3.2-1, 75	Bolting	Steel; stainless steel	Condensation	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
	V.E.EP-121	3.2-1, 15	Bolting	Steel; stainless steel	Fuel oil	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	V.E.E-417	3.2-1, 75	Bolting	Steel; stainless steel	Fuel oil, lubricating oil	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	V.E.E-429	3.2-1, 86	Bolting	Steel; stainless steel	Raw water, waste water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M18, "Bolting Integrity"	No
M	V.E.EP-119	3.2-1, 15	Bolting	Steel; stainless steel	Raw water, waste water	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	V.E.E-431	3.2-1, 86	Bolting	Steel; stainless steel	Treated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M18, "Bolting Integrity"	No

V ENGINEERED SAFETY FEATURES
Table E External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	V.E.EP-122	3.2-1, 15	Bolting	Steel; stainless steel	Treated water	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
	V.E.E-02	3.2-1, 14	Closure bolting	Steel	Air with steam or water leakage	Loss of material due to general corrosion	AMP XI.M18, "Bolting Integrity"	No
	V.E.E-03	3.2-1, 12	Closure bolting	Steel, high-strength	Air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	AMP XI.M18, "Bolting Integrity"	No
	V.E.EP-70	3.2-1, 13	Closure bolting	Steel; stainless steel	Air – indoor uncontrolled (external)	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M18, "Bolting Integrity"	No
	V.E.EP-69	3.2-1, 15	Closure bolting	Steel; stainless steel	Air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
	V.E.E-44	3.2-1, 40	External surfaces	Steel	Air – indoor uncontrolled (external)	Loss of material due to general corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
	V.E.E-45	3.2-1, 41	External surfaces	Steel	Air – outdoor (External)	Loss of material due to general corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No

V ENGINEERED SAFETY FEATURES
Table E External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	V.E.E-28	3.2-1, 9	External surfaces	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	V.E.E-46	3.2-1, 39	External surfaces	Steel	Condensation (External)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	V.E.E-424	3.2-1, 81	Heat exchanger components	Stainless steel, steel, aluminum, copper alloy, titanium	Air, condensation (external)	Reduction of heat transfer due to fouling	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	V.E.E-452	3.2-1, 109	Insulated piping, piping components, tanks	Aluminum	Condensation, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	V.E.E-406	3.2-1, 71	Insulated piping, piping components, tanks	Copper alloy (> 15% Zn)	Condensation, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	V.E.E-451	3.2-1, 108	Insulated piping, piping components, tanks	Stainless steel	Condensation, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes

V ENGINEERED SAFETY FEATURES
Table E External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.E.E-403	3.2-1, 69	Insulated piping, piping components, tanks	Steel, copper alloy, aluminum	Condensation, air – outdoor	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	V.E.E-450	3.2-1, 107	Insulated tanks	Stainless steel	Condensation, air – outdoor, air – indoor uncontrolled, air – indoor controlled	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
N	V.E.E-422	3.2-1, 87	Jacketed thermal insulation	Any	Air – indoor uncontrolled, air – outdoor environment, air with borated water leakage, air with reactor coolant leakage, air with steam or water leakage	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	V.E.EP-114	3.2-1, 42	Piping, piping components	Aluminum	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	V.E.E-444	3.2-1, 101	Piping, piping components	Aluminum	Air – outdoor, raw water, waste water, condensation (external)	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces monitoring of Mechanical Components"	Yes

V ENGINEERED SAFETY FEATURES
Table E External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.E.EP-38	3.2-1, 8	Piping, piping components	Copper alloy (>15% Zn)	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
N	V.E.E-433	3.2-1, 89	Piping, piping components	Steel, stainless steel, nickel alloy, copper alloy, aluminum	Condensation	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	V.E.E-426	3.2-1, 83	Seals, piping, piping components	Elastomer	Air – outdoor	Hardening and loss of strength due to elastomer degradation	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	V.E.E-442	3.2-1, 99	Tanks	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	V.E.E-454	3.2-1, 111	Underground piping, piping components	Aluminum	Air (external)	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes
N	V.E.E-456	3.2-1, 113	Underground piping, piping components	Stainless steel	Air – indoor uncontrolled, condensation, air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
N	V.E.E-455	3.2-1, 112	Underground piping, piping components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion	AMP XI.M41, "Buried and Underground Piping and Tanks"	No

V ENGINEERED SAFETY FEATURES

Table E External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.E.EP-123	3.2-1, 53a	Underground piping, piping components	Steel, nickel alloy	Air – indoor uncontrolled, condensation, air-outdoor, raw water	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M41, "Buried and Underground Piping and Tanks"	No

F. COMMON MISCELLANEOUS MATERIAL/ENVIRONMENT COMBINATIONS

Systems, Structures, and Components

This section addresses the aging management programs (AMPs) for miscellaneous material/environment combinations which may be found throughout the emergency safety feature system's structures and components (SCs). For the material/environment combinations in this part, aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation. With the exception of components within the scope of American Society of Mechanical Engineers (ASME) Code Section XI, no AMPs for these SCs are required.

System Interfaces

The SCs covered in this section belong to the engineered safety features in pressurized water reactors (PWRs) and boiling water reactor (BWRs). (For example, see System Interfaces in V.A to V.D2 for details.)

V ENGINEERED SAFETY FEATURES
Table F Common Miscellaneous Material/Environment Combinations

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	V.F.EP-14	3.2-1, 59	Ducting, piping, components	Galvanized steel	Air – indoor controlled (External)	None	None	No
	V.F.EP-15	3.2-1, 60	Piping elements	Glass	Air – indoor uncontrolled (external)	None	None	No
	V.F.EP-87	3.2-1, 60	Piping elements	Glass	Air – outdoor	None	None	No
	V.F.EP-65	3.2-1, 60	Piping elements	Glass	Air with borated water leakage	None	None	No
	V.F.EP-68	3.2-1, 60	Piping elements	Glass	Closed-cycle cooling water	None	None	No
	V.F.EP-66	3.2-1, 60	Piping elements	Glass	Condensation (Internal/External)	None	None	No
	V.F.EP-67	3.2-1, 60	Piping elements	Glass	Gas	None	None	No
	V.F.EP-16	3.2-1, 60	Piping elements	Glass	Lubricating oil	None	None	No
	V.F.EP-28	3.2-1, 60	Piping elements	Glass	Raw water	None	None	No

V Table F	ENGINEERED SAFETY FEATURES Common Miscellaneous Material/Environment Combinations							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	V.F.EP-30	3.2-1, 60	Piping elements	Glass	Treated borated water	None	None	No
	V.F.EP-29	3.2-1, 60	Piping elements	Glass	Treated water	None	None	No
M	V.F.EP-3	3.2-1, 56	Piping, piping components	Aluminum	Air – indoor uncontrolled (internal)	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes
M	V.F.EP-10	3.2-1, 57	Piping, piping components	Copper alloy	Air – indoor uncontrolled (external)	None	None	No
M	V.F.EP-12	3.2-1, 58	Piping, piping components	Copper alloy	Air with borated water leakage	None	None	No
M	V.F.EP-9	3.2-1, 57	Piping, piping components	Copper alloy	Gas	None	None	No
N	V.F.E-438	3.2-1, 95	Piping, piping components	Copper alloy (≤8% Al)	Air with borated water leakage	None	None	No
M	V.F.EP-17	3.2-1, 61	Piping, piping components	Nickel alloy	Air – indoor uncontrolled (external)	None	None	No
M	V.F.EP-115	3.2-1, 62	Piping, piping components	Nickel alloy	Air with borated water leakage	None	None	No

V ENGINEERED SAFETY FEATURES
Table F Common Miscellaneous Material/Environment Combinations

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	V.F.EP-18	3.2-1, 63	Piping, piping components	Stainless steel	Air – indoor uncontrolled (external)	None	None	No
M	V.F.EP-82	3.2-1, 63	Piping, piping components	Stainless steel	Air – indoor uncontrolled (internal)	None	None	No
M	V.F.EP-19	3.2-1, 63	Piping, piping components	Stainless steel	Air with borated water leakage	None	None	No
M	V.F.EP-20	3.2-1, 91	Piping, piping components	Stainless steel	Concrete	None	None	Yes
M	V.F.EP-22	3.2-1, 63	Piping, piping components	Stainless steel	Gas	None	None	No
M	V.F.EP-4	3.2-1, 64	Piping, piping components	Steel	Air – indoor controlled (external)	None	None	No
M	V.F.EP-112	3.2-1, 55	Piping, piping components	Steel	Concrete	None	None	Yes
M	V.F.EP-7	3.2-1, 64	Piping, piping components	Steel	Gas	None	None	No

CHAPTER VI

ELECTRICAL COMPONENTS

VI ELECTRICAL COMPONENTS

A. EQUIPMENT NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

B. EQUIPMENT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

A. EQUIPMENT NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

Systems, Structures, and Components

This section addresses electrical cables and connections that are not subject to the environmental qualification (EQ) requirements of 10 CFR 50.49 and that are installed in power and instrumentation and control (I&C) applications. The power, control and instrumentation cables and connections addressed are low-voltage [i.e., typical operating voltage of less than 1,000v–but no greater than 2 kilovolts (kV) and medium-voltage (2 kV to 35 kV)]. High voltage (>35 kV) power cables and connections have unique, specialized constructions and must be evaluated on a plant-specific basis.

This section also addresses components that are relied upon to meet the station blackout (SBO) requirements for restoration of offsite power. The offsite power system relied upon in the plant-specific current licensing basis (CLB) for compliance with 10 CFR 50.63, that connects the plant to the offsite power source, is included in the SBO restoration equipment scope. The electrical distribution equipment out to the first circuit breaker with the offsite distribution system (i.e., equipment in the switchyard) is included within the SBO restoration equipment scope of license renewal. This path typically includes the circuit breakers that connect to the offsite system power transformers (startup transformers), the transformers themselves, the intervening overhead or underground circuits between the circuit breaker and transformer and the transformer onsite electrical distribution system, and the associated control circuits and structures. However, the staff's review is based on the plant-specific CLB, regulatory requirements, and offsite power design configurations.

Electrical cables and their required terminations (i.e., connections) are typically reviewed as a single commodity. The types of connections included in this review are splices, mechanical connectors, fuse holders, and terminal blocks. This common review is translated into program actions, which treat cables and connections in the same manner.

Electrical cables and connections that are in the plant’s environmental qualification (EQ) program are addressed in VI.B.

System Interfaces

Electrical cables and connections functionally interface with all plant systems that rely on electric power or I&C. Electrical cables and connections also interface with and are supported by structural commodities (e.g., cable trays, conduit, cable trenches, cable troughs, duct banks, cable vaults, and manholes) that are reviewed, as appropriate, in the systems, structures, and components (SSCs) section.

VI ELECTRICAL COMPONENTS
Table A Equipment Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VI.A.L-11	3.6-1, 29	Cable Bus	Electrical insulation; insulators	Air – indoor controlled or uncontrolled, air – outdoor	Reduced electrical insulation resistance due to degradation caused thermal/thermoxidative degradation of organics and photolysis (UV sensitive materials only) of organics, moisture/debris intrusion and ohmic heating	A plant-specific aging management program is to be evaluated	Yes
N	VI.A.L-10	3.6-1, 28	Cable Bus: bus/connections	Various metals used for electrical bus connections	Air – indoor controlled or uncontrolled, air – outdoor	Increased electrical resistance of connection due to the loosening of bolts caused by thermal cycling and ohmic heating	A plant-specific aging management program is to be evaluated	Yes
N	VI.A.L-08	3.6-1, 26	Cable Bus: enclosure assemblies	Elastomer	Air – indoor controlled or uncontrolled, air – outdoor	Surface cracking, crazing, scuffing, dimensional change (e.g. "ballooning" and "necking"), shrinkage, discoloration, hardening, loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated	Yes
N	VI.A.L-09	3.6-1, 27	Cable Bus: external surface of enclosure assemblies	Galvanized steel; aluminum	Air – indoor controlled or uncontrolled	None	None	No
N	VI.A.L-13	3.6-1, 31	Cable Bus: external surface of enclosure assemblies	Galvanized steel; aluminum	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	A plant-specific aging management program is to be evaluated	Yes

VI ELECTRICAL COMPONENTS
Table A Equipment Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VI.A.L-14	3.6-1, 32	Cable Bus: external surface of enclosure assemblies	Steel	Air – indoor controlled	None	None	No
N	VI.A.L-12	3.6-1, 30	Cable Bus: external surface of enclosure assemblies	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	A plant-specific aging management program is to be evaluated	Yes
M	VI.A.LP-30	3.6-1, 19	Cable connections (metallic parts)	Various metals used for electrical contacts	Air – indoor controlled or uncontrolled, air – outdoor	Increased electrical resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, oxidation	AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No
M	VI.A.LP-35	3.6-1, 10	Electrical conductor insulation for inaccessible power cables, instrumentation and control cables (e.g., installed in duct bank, buried conduit or direct buried)	Various organic polymers (e.g., EPR, SR, EPDM, XLPE)	Adverse localized environment caused by significant moisture	Reduced electrical insulation resistance due to moisture	AMPs XI.E3A, XI.E3B, XI.E3C, "Inaccessible Power, control and instrumentation cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No
M	VI.A.LP-36	3.6-1, 20	Electrical connector contacts for electrical	Various metals used for electrical contacts	Air with borated water leakage	Increased electrical resistance of connection due to corrosion of connector contact	AMP XI.M10, "Boric Acid Corrosion"	No

VI Table A — ELECTRICAL COMPONENTS
Equipment Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			connectors			surfaces caused by intrusion of borated water		
M	VI.A.LP-34	3.6-1, 9	Electrical insulation for electrical cables and connections used in instrumentation circuits that are sensitive to reduction in conductor electrical insulation resistance (IR)	Various organic polymers (e.g., EPR, SR, EPDM, XLPE)	Adverse localized environment caused by heat, radiation, or moisture	Reduced electrical insulation resistance due to thermal/thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	AMP XI.E2, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits"	No
M	VI.A.LP-33	3.6-1, 8	Electrical insulation for electrical cables and connections (including terminal blocks, etc.)	Various organic polymers (e.g., EPR, SR, EPDM, XLPE)	Adverse localized environment caused by heat, radiation, or moisture	Reduced electrical insulation resistance due to thermal/thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	AMP XI.E1, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No
M	VI.A.LP-24	3.6-1, 22	Fuse holders (not part of active equipment): electrical insulation	Electrical insulation: bakelite; phenolic melamine or ceramic; molded	Air – indoor controlled or uncontrolled	Reduced electrical insulation resistance due to thermal/thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive	AMP XI.E5, "Fuse Holders" No aging management program is required for	No

VI ELECTRICAL COMPONENTS
Table A Equipment Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
				polycarbonate; other		materials only) of organics; radiation-induced oxidation; moisture intrusion	those applicants who can demonstrate these fuse holders are located in an environment that does not subject them to environmental aging mechanisms	
M	VI.A.LP-31	3.6-1, 18	Fuse holders (not part of active equipment): metallic clamps	Various metals used for electrical connections	Air – indoor controlled or uncontrolled	Increased electrical resistance of connection due to fatigue caused by frequent manipulation or vibration	AMP XI.E5, "Fuse Holders" No aging management program is required for those applicants who can demonstrate these fuse holders are located in an environment that does not subject them to environmental aging mechanisms and effects including fatigue caused	No

VI ELECTRICAL COMPONENTS
Table A Equipment Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							by frequent manipulation or vibration.	
N	VI.A.L-07	3.6-1, 17	Fuse holders (not part of active equipment): metallic clamps	Various metals used for electrical connections	Air – indoor controlled or uncontrolled	Increased electrical resistance of connection due to fatigue due to ohmic heating, thermal cycling, electrical transients	AMP XI.E5, "Fuse Holders" No aging management program is required for those applicants who can demonstrate these fuse holders are not subject them to fatigue due to ohmic heating, thermal cycling, electrical transients	No
M	VI.A.LP-23	3.6-1, 16	Fuse holders (not part of active equipment): metallic clamps	Various metals used for electrical connections	Air – indoor uncontrolled	Increased electrical resistance of connection due to chemical contamination, corrosion, and oxidation (in an air, indoor controlled environment, increased resistance of connection due to chemical contamination, corrosion and oxidation do not apply)	AMP XI.E5, "Fuse Holders" No aging management program is required for those applicants who can demonstrate these fuse	No

VI Table A — ELECTRICAL COMPONENTS
Equipment Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							holders are located in an environment that does not subject them to environmental aging mechanisms and effects due to chemical contamination, corrosion, and oxidation.	
M	VI.A.LP-32	3.6-1, 2	High-voltage electrical insulators	Porcelain; malleable iron; aluminum; galvanized steel; cement	Air – outdoor	Loss of material due to mechanical wear caused by movement of transmission conductors due to significant wind	AMP XI.E.7, "High Voltage Insulators"	No
M	VI.A.LP-28	3.6-1, 3	High-voltage electrical insulators	Porcelain; malleable iron; aluminum; galvanized steel; cement	Air – outdoor	Reduced electrical insulation resistance due to presence of salt deposits or surface contamination	AMP XI.E.7, "High Voltage Insulators"	No
M	VI.A.LP-25	3.6-1, 12	Metal enclosed bus: bus/connections	Various metals used for electrical bus and connections	Air – indoor controlled or uncontrolled, air – outdoor	Increased electrical resistance of connection due to the loosening of bolts caused by thermal cycling and ohmic heating	AMP XI.E4, "Metal Enclosed Bus"	No
M	VI.A.LP-26	3.6-1, 13	Metal enclosed bus: electrical insulation; electrical insulators	Porcelain; xenoy; thermo-plastic organic polymers	Air – indoor controlled or uncontrolled, air – outdoor	Reduced electrical insulation resistance due to thermal/thermoxidative degradation of organics/thermoplastics, radiation-induced	AMP XI.E4, "Metal Enclosed Bus"	No

VI ELECTRICAL COMPONENTS
Table A Equipment Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						oxidation, moisture/debris intrusion, ohmic heating		
	VI.A.LP-29	3.6-1, 11	Metal enclosed bus: enclosure assemblies	Elastomer	Air – indoor controlled or uncontrolled, air – outdoor	Surface cracking, crazing, scuffing, dimensional change (e.g. "ballooning" and "necking"), shrinkage, discoloration, hardening, loss of strength due to elastomer degradation	AMP XI.E4, "Metal Enclosed Bus," or AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VI.A.LP-41	3.6-1, 23	Metal enclosed bus: external surface of enclosure assemblies	Galvanized steel; aluminum	Air – indoor controlled or uncontrolled	None	None	No
	VI.A.LP-42	3.6-1, 15	Metal enclosed bus: external surface of enclosure assemblies	Galvanized steel; aluminum	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.E4, "Metal Enclosed Bus," or AMP XI.S6, "Structures Monitoring"	No
	VI.A.LP-44	3.6-1, 24	Metal enclosed bus: external surface of enclosure assemblies	Steel	Air – indoor controlled	None	None	No
	VI.A.LP-43	3.6-1, 14	Metal enclosed bus: external surface of enclosure	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.E4, "Metal Enclosed Bus," or AMP XI.S6,	No

VI ELECTRICAL COMPONENTS
Table A Equipment Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			assemblies				"Structures Monitoring"	
M	VI.A.LP-39	3.6-1, 6	Switchyard bus and connections	Aluminum; copper; bronze; stainless steel; galvanized steel	Air – outdoor	Loss of material due to wind-induced abrasion; Increased resistance of connection due to oxidation or loss of pre-load	A plant-specific aging management program is to be evaluated	Yes
M	VI.A.LP-46	3.6-1, 21	Transmission conductors	Aluminum	Air – outdoor	Loss of conductor strength due to corrosion	None - for Aluminum Conductor Aluminum Alloy Reinforced (ACAR) and All Aluminum Conductor (AAC)	No
M	VI.A.LP-48	3.6-1, 5	Transmission conductors	Aluminum; steel	Air – outdoor	Increased resistance of connection due to oxidation or loss of pre-load	A plant-specific aging management program is to be evaluated	Yes
M	VI.A.LP-38	3.6-1, 4	Transmission conductors	Aluminum; steel	Air – outdoor	Loss of conductor strength due to corrosion	A plant-specific aging management program is to be evaluated for Aluminum Conductor Steel Reinforced (ACSR)	Yes

VI ELECTRICAL COMPONENTS
Table A Equipment Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VI.A.LP-47	3.6-1, 7	Transmission conductors	Aluminum; Steel	Air – outdoor	Loss of material due to wind-induced abrasion	A plant-specific aging management program is to be evaluated for ACAR and ACSR	Yes

B. EQUIPMENT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

Systems, Structures, and Components

The U.S. Nuclear Regulatory Commission (NRC) has established nuclear station environmental qualification (EQ) requirements in 10 CFR Part 50 Appendix A, Criterion 4, and in 10 CFR 50.49. 10 CFR 50.49 specifically requires that an EQ program be established to demonstrate that certain electrical components located in harsh plant environments (i.e., those areas of the plant that could be subject to the harsh environmental effects of a loss of coolant accident (LOCA), high-energy line breaks (HELBs) or post-LOCA radiation) are qualified to perform their safety function in those harsh environments after the effects of inservice aging. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of EQ. Components in the EQ program have a qualified life, and the components are replaced at the end of that qualified life if it is shorter than the current operating term. The qualified life may be extended by methods such as refurbishment, reanalysis, or through ongoing qualification but the licensee is required by the EQ regulation (10 CFR 50.49) to replace the component when its qualified life has expired.

Similarly, some nuclear power plants (NPPs) have mechanical equipment that was qualified in accordance with the provisions of Criterion 4 of Appendix A to 10 CFR Part 50.

System Interfaces

Equipment subject to 10 CFR 50.49 EQ requirements could functionally interface with all plant systems that rely on electric power or instrumentation and control (I&C).

VI ELECTRICAL COMPONENTS
Table B Equipment Subject to 10 CFR 50.49 Environmental Qualification Requirements

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VI.B.L-05	3.6-1, 1	Electrical equipment subject to 10 CFR 50.49 EQ requirements	Various polymeric and metallic materials	Areas of the plant that could be subject to harsh environmental effects of a loss of coolant accident (LOCA), high energy line break, or post LOCA environment Adverse localized environment (e.g., temperature, radiation, or moisture)	Various aging effects due to various mechanisms in accordance with 10 CFR 50.49 Various aging mechanisms and effects due to adverse localized environments.	EQ is a time-limited aging analysis (TLAA) to be evaluated for the subsequent period of extended operation. See the Standard Review Plan, Section 4.4, "Environmental Qualification (EQ) of Electrical Equipment," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii). See AMP X.E1, "Environmental Qualification (EQ) of Electric Components," of this report for meeting the requirements	Yes

VI ELECTRICAL COMPONENTS

Table B Equipment Subject to 10 CFR 50.49 Environmental Qualification Requirements

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							of 10 CFR 54.21(c)(1)(iii).	

CHAPTER VII

AUXILIARY SYSTEMS

VII AUXILIARY SYSTEMS

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A1. NEW FUEL STORAGE

Systems, Structures, and Components

This section discusses those structures and components (SCs) used for new fuel storage which include carbon steel new fuel storage racks located in the auxiliary building or the fuel handling building. The racks are exposed to the temperature and humidity in the auxiliary building. The racks are generally painted with a protective coating. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components used for new fuel storage are governed by Group C Quality Standards.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

System Interfaces

No other systems discussed in this report interface with those used for new fuel storage.

VII AUXILIARY SYSTEMS
Table A1 New Fuel Storage

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.A1.A-94	3.3-1, 111	Structural steel	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No

A2. SPENT FUEL STORAGE

Systems, Structures, and Components

This section discusses those structures and components (SCs) used for spent fuel storage and includes stainless steel (SS) spent fuel storage racks and neutron-absorbing materials (e.g., Boraflex, Boral®, or boron-steel sheets, if used) submerged in chemically treated oxygenated boiling water reactor (BWR) or borated pressurized water reactor (PWR) water. The intended function of a spent fuel rack is to separate spent fuel assemblies. Boraflex sheets fastened to the storage cells provide for neutron absorption and help maintain subcriticality of spent fuel assemblies in the spent fuel pool (SFP).

Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components used for spent fuel storage are governed by Group C Quality Standards. In some plants, the Boraflex has been replaced by Boral® or boron steel.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

No other systems discussed in this report interface with those used for spent fuel storage.

VII AUXILIARY SYSTEMS
Table A2 Spent Fuel Storage

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.A2.AP-79	3.3-1, 125	Piping, piping components	Steel (with stainless steel cladding); stainless steel	Treated borated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VII.A2.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.A2.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.A2.A-429	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes

VII Table A2	AUXILIARY SYSTEMS Spent Fuel Storage							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VII.A2.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	VII.A2.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.A2.A-98	3.3-1, 125	Spent fuel storage racks (BWR)	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
	VII.A2.A-96	3.3-1, 124	Spent fuel storage racks (BWR)	Stainless steel	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.A2.A-99	3.3-1, 125	Spent fuel storage racks (PWR)	Stainless steel	Treated borated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
	VII.A2.A-97	3.3-1, 124	Spent fuel storage racks (PWR)	Stainless steel	Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

VII AUXILIARY SYSTEMS
Table A2 Spent Fuel Storage

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.A2.A-87	3.3-1, 51	Spent fuel storage racks: neutron-absorbing sheets (BWR)	Boraflex	Treated water	Reduction of neutron-absorbing capacity due to boraflex degradation	AMP XI.M22, "Boraflex Monitoring"	No
	VII.A2.AP-236	3.3-1, 102	Spent fuel storage racks: neutron-absorbing sheets (BWR)	Boral®; boron steel, and other materials (excluding Boraflex)	Treated water	Reduction of neutron-absorbing capacity; change in dimensions and loss of material due to effects of SFP environment	AMP XI.M40, "Monitoring of Neutron-Absorbing Materials other than Boraflex"	No
	VII.A2.A-86	3.3-1, 51	Spent fuel storage racks: neutron-absorbing sheets (PWR)	Boraflex	Treated borated water	Reduction of neutron-absorbing capacity due to boraflex degradation	AMP XI.M22, "Boraflex Monitoring"	No
	VII.A2.AP-235	3.3-1, 102	Spent fuel storage racks: neutron-absorbing sheets (PWR)	Boral®; boron steel, and other materials (excluding Boraflex)	Treated borated water	Reduction of neutron-absorbing capacity; change in dimensions and loss of material due to effects of SFP environment	AMP XI.M40, "Monitoring of Neutron-Absorbing Materials other than Boraflex"	No
D	VII.A2.A-405							

A3. SPENT FUEL POOL COOLING AND CLEANUP (PRESSURIZED WATER REACTOR)

Systems, Structures, and Components

This section discusses the pressurized water reactor (PWR) spent fuel pool (SFP) cooling and cleanup system and consists of piping, valves, heat exchangers, filters, linings, demineralizers, and pumps. The system contains borated water. The system removes heat from the SFP and transfers heat to the open-cycle cooling water (OCCW) system, which in turn transfers heat to the OCCW system. Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components that comprise the PWR SFP cooling and cleanup system are governed by Group C Quality Standards.

With respect to filters, these items are to be addressed consistent with the U.S. Nuclear Regulatory Commission (NRC) position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of the Nuclear Energy Institute (NEI), dated March 10, 2000. Specifically, components that function as system filters are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review (AMR) under 10 CFR 54.21(a)(1)(ii). As part of the methodology description, the application should identify the standards that are relied on for replacement, for example, National Fire Protection Association (NFPA) standards for fire protection equipment.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an AMR.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the PWR spent fuel cooling and cleanup system are the PWR emergency core cooling system (V.D1), the closed-cycle cooling water (CCCW) system (VII.C2), and the PWR chemical and volume control system (CVCS) (VII.E1).

VII AUXILIARY SYSTEMS
Table A3 Spent Fuel Pool Cooling and Cleanup (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.A3.A-79	3.3-1, 9	External surfaces	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	VII.A3.AP-189	3.3-1, 46	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No
	VII.A3.A-101	3.3-1, 17	Heat exchanger tubes	Stainless steel	Treated borated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.A3.AP-1	3.3-1, 9	Piping, piping components	Aluminum	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	VII.A3.AP-199	3.3-1, 46	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.A3.AP-43	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.A3.AP-31	3.3-1, 72	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.A3.AP-79	3.3-1, 125	Piping, piping components	Steel (with stainless steel cladding);	Treated borated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes

VII AUXILIARY SYSTEMS
Table A3 Spent Fuel Pool Cooling and Cleanup (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
				stainless steel				
M	VII.A3.A-56	3.3-1, 124	Piping, piping components	Steel (with stainless steel or nickel-alloy cladding)	Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.A3.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.A3.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.A3.A-429	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in	Yes

VII AUXILIARY SYSTEMS
Table A3 Spent Fuel Pool Cooling and Cleanup (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
					(internal)		Miscellaneous Piping and Ducting Components"	
M	VII.A3.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	VII.A3.AP-100	3.3-1, 86	Seals, piping, and piping components	Elastomer	Treated borated water	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.A3.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
D	VII.A3.A-405							

A4. SPENT FUEL POOL COOLING AND CLEANUP (BOILING WATER REACTOR)

Systems, Structures, and Components

This section discusses the boiling water reactor (BWR) spent fuel pool (SFP) cooling and cleanup system and consists of piping, valves, heat exchangers, filters, linings, demineralizers, and pumps. The system contains chemically treated oxygenated water. The system removes heat from the SFP and transfers the heat to the closed-cycle cooling water (CCCW) system, which in turn transfers the heat to the open-cycle cooling water (OCCW) system. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the BWR SFP cooling and cleanup system are governed by Group C Quality Standards.

With respect to filters, these items are to be addressed consistent with the U.S. Nuclear Regulatory Commission (NRC) position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of the Nuclear Energy Institute (NEI), dated March 10, 2000. Specifically, components that function as system filters are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review (AMR) under 10 CFR 54.21(a)(1)(ii). As part of the methodology description, the application should identify the standards that are relied on for replacement, for example, National Fire Protection Association (NFPA) standards for fire protection equipment.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an AMR.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the BWR spent fuel cooling and cleanup system are the CCCW system (VII.C2) and the condensate system (VIII.E).

VII AUXILIARY SYSTEMS
Table A4 Spent Fuel Pool Cooling and Cleanup (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.A4.A-439	3.3-1, 193	Any	Steel	Treated water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
M	VII.A4.AP-111	3.3-1, 203	Heat exchanger components	Stainless steel; steel with stainless steel cladding	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VII.A4.AP-189	3.3-1, 46	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No
	VII.A4.AP-139	3.3-1, 17	Heat exchanger tubes	Stainless steel	Treated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.A4.AP-130	3.3-1, 25	Piping	Aluminum	Treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.A4.AP-199	3.3-1, 46	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No

VII AUXILIARY SYSTEMS
Table A4 Spent Fuel Pool Cooling and Cleanup (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.A4.AP-140	3.3-1, 22	Piping, piping components	Copper alloy	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.A4.AP-43	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.A4.AP-32	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.A4.AP-31	3.3-1, 72	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.A4.AP-110	3.3-1, 203	Piping, piping components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VII.A4.AP-108	3.3-1, 26	Piping, piping components	Steel with stainless steel cladding	Treated water	Loss of material due to pitting, crevice corrosion (only after cladding degradation)	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.A4.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion;	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components,	No

VII Table A4 — AUXILIARY SYSTEMS — Spent Fuel Pool Cooling and Cleanup (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			coatings/linings		water, lubricating oil, waste water	cracking due to stress corrosion cracking	Heat Exchangers, and Tanks"	
M	VII.A4.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.A4.A-429	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VII.A4.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	VII.A4.AP-101	3.3-1, 86	Seals, piping, and piping components	Elastomer	Treated water	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting	No

VII AUXILIARY SYSTEMS
Table A4 Spent Fuel Pool Cooling and Cleanup (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components"	
N	VII.A4.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
D	VII.A4.A-405							

A5. SUPPRESSION POOL CLEANUP SYSTEM (BOILING WATER REACTOR)

Systems, Structures, and Components

This section discusses the suppression pool cleanup system, which maintains water quality in the suppression pool in boiling water reactors (BWRs). The components of this system include piping, filters, valves, and pumps. These components are fabricated of carbon, low-alloy, or austenitic stainless steel (SS). Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” the components that comprise the suppression pool cleanup system are governed by the same Group C Quality Standards Group as the corresponding components in the spent fuel pool (SFP) cooling and cleanup system (VII.A4).

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The system that interfaces with the suppression pool cleanup system is the boiling water reactor (BWR) containments (II.B), or BWR emergency core cooling system (V.D2).

Evaluation Summary

There are no tables associated with this section because the suppression pool cleanup system in BWRs is similar to the SFP cooling and cleanup system (VII.A4), and the components in the two systems are identical or very similar. Therefore, the reader is referred to the section for the spent fuel storage pool system for a listing of aging effects, aging mechanisms, and AMPs that are to be applied to the suppression pool cleanup system components. [The only component in VII.A4 that may not be applicable to the suppression pool cleanup system is the heat exchanger (AMR line-items VII.A4.AP-111, VII.A4.4AP-139, VII.A4.AP-189)].

B. OVERHEAD HEAVY LOAD AND LIGHT LOAD (RELATED TO REFUELING) HANDLING SYSTEMS

Systems, Structures, and Components

Most commercial nuclear facilities have between 50 and 100 cranes. Many of these cranes are industrial grade cranes that must meet the requirements of 29 CFR Volume XVII, Part 1910, and Section 1910.179. They do not fall within the scope of 10 CFR Part 54.4 and therefore are not required to be part of the integrated plant assessment (IPA). Normally fewer than 10 cranes fall within the scope of 10 CFR Part 54.4. These cranes must comply with the requirements provided in 10 CFR Part 50.65 and Regulatory Guide (RG) 1.160 for monitoring the effectiveness of maintenance at nuclear power plants (NPPs).

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (the Program) must demonstrate that the testing and the monitoring of the maintenance programs have been completed to ensure that the structures, systems, and components of these cranes are capable of sustaining their rated loads during the period of extended operation. The inspection is also to evaluate whether the usage of the cranes or hoists has been sufficient to warrant additional fatigue analysis. It should be noted that many of the structures and components (SCs) of these cranes can be classified as moving parts or as components which change configuration, or they may be subject to replacement based on a qualified life. In any of these cases, they will not fall within the scope of this aging management review (AMR). The primary components that this program is concerned with are the structural girders and beams that make up the bridge and the trolley.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

System Interfaces

No other systems discussed in this report interface with the overhead heavy load and light load (related to refueling) handling systems. Physical interfaces exist with the supporting structure. The direct interface is at the connection to the structure.

VII AUXILIARY SYSTEMS
Table B Overhead Heavy Load and Light Load (Related to Refueling Handling Systems)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.B.A-05	3.3-1, 53	Cranes: rails	Steel	Air – indoor uncontrolled , air – outdoor	Loss of material due to wear	AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No
M	VII.B.A-07	3.3-1, 52	Cranes: rails and structural girders	Steel	Air – indoor uncontrolled , air – outdoor	Loss of material due to general corrosion	AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No
M	VII.B.A-06	3.3-1, 1	Cranes: structural girders	Steel	Air – indoor uncontrolled (external), air – outdoor	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.7, "Other Plant-Specific TLAAs"	Yes
N	VII.B.A-731	3.3-1, 200	Structural bolting	High-strength steel	Air – indoor uncontrolled, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling	No

VII AUXILIARY SYSTEMS
Table B Overhead Heavy Load and Light Load (Related to Refueling Handling Systems)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Systems"	
N	VII.B.A-730	3.3-1, 199	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of preload due to self-loosening	AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No

C1. OPEN-CYCLE COOLING WATER SYSTEM (SERVICE WATER SYSTEM)

Systems, Structures, and Components

This section discusses the open-cycle cooling water (OCCW) (or service water) system, which consists of piping, heat exchangers, pumps, flow orifices, basket strainers, and valves, including containment isolation valves. Because the characteristics of an OCCW system may be unique to each facility, the OCCW system is defined as a system or systems that transfer heat from safety-related systems, structures and components (SSCs) to the ultimate heat sink (UHS), such as a lake, ocean, river, spray pond, or cooling tower. The aging management programs (AMPs) described in this section apply to any such system, provided the service conditions and materials of construction are identical to those identified in the section. The system removes heat from the closed-cycle cooling water (CCCW) system, and, in some plants, other auxiliary systems and components, such as steam turbine bearing oil coolers or miscellaneous coolers in the condensate system. The only heat exchangers addressed in this section are those removing heat from the CCCW system. Heat exchangers for removing heat from other auxiliary systems and components are addressed in their respective systems, such as those for the steam turbine bearing oil coolers (VIII.A) and for the condensate system coolers (VIII.E).

Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the OCCW system are governed by Group C Quality Standards, with the exception of those forming part of the containment penetration boundary which are governed by Group B Quality Standards.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

AMPs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that may interface with the open-cycle cooling water (OCCW) system include the closed-cycle cooling water (CCCW) system (VII.C2), the ultimate heat sink (UHS) (VII.C3), the emergency diesel generator (EDG) system (VII.H2), the containment spray system (V.A), the [pressurized water reactor (PWR)] steam generator (SG) blowdown system (VIII.F), the condensate system (VIII.E), the auxiliary feedwater (AFW) system (PWR) (VIII.G), the emergency core cooling system (PWR) (V.D1), and the emergency core cooling system boiling water reactor (BWR) (V.D2).

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.C1.A-469	3.3-1, 193	Any	Steel	Waste water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
N	VII.C1.A-426	3.3-1, 145	Bolting	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C1.AP-179	3.3-1, 38	Heat exchanger components	Copper alloy	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
	VII.C1.A-66	3.3-1, 72	Heat exchanger components	Copper alloy (>15% Zn or >8% Al)	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.C1.AP-183	3.3-1, 38	Heat exchanger components	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
N	VII.C1.A-418	3.3-1, 96.4	Heat exchanger components (for	Stainless steel, aluminum	Condensation	Loss of material due to general, pitting, crevice corrosion; fouling	AMP XI.M38, "Inspection of Internal Surfaces in	No

VII Table C1 AUXILIARY SYSTEMS
Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			components not covered by NRC GL 89-13)			that leads to corrosion	Miscellaneous Piping and Ducting Components"	
N	VII.C1.A-417	3.3-1, 96.4	Heat exchanger components (for components not covered by NRC GL 89-13)	Steel, copper alloy	Condensation	Loss of material due to general, pitting, crevice corrosion; fouling that leads to corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C1.A-733	3.3-1, 204	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air (external), condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.C1.AP-152	3.3-1, 123	Heat exchanger components other than tubes	Titanium (ASTM Grades 1, 2, 7, 11, or 12)	Raw water	None	None	No
	VII.C1.A-72	3.3-1, 42	Heat exchanger tubes	Copper alloy	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
	VII.C1.AP-187	3.3-1, 42	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.C1.AP-153	3.3-1, 42	Heat exchanger tubes	Titanium	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
N	VII.C1.A-736	3.3-1, 207	Heat exchanger tubes (for components not covered by NRC GL 89-13)	Stainless steel, copper alloy, titanium	Raw water	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C1.A-419	3.3-1, 96.2	Heat exchanger tubes (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy, aluminum	Condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.C1.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.C1.A-750	3.3-1, 221	Piping, piping components	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of	Yes

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Mechanical Components"	
M	VII.C1.AP-173	3.3-1, 108	Piping, piping components	Aluminum	Soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C1.A-409	3.3-1, 126	Piping, piping components	Any	Raw water	Wall thinning due to erosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	VII.C1.AP-237	3.3-1, 105	Piping, piping components	Asbestos cement pipe	Soil, concrete	Cracking, spalling, corrosion of rebar due to exposure of rebar	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C1.AP-178	3.3-1, 105	Piping, piping components	Concrete	Soil, concrete	Cracking, spalling, corrosion of rebar due to exposure of rebar	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C1.AP-177	3.3-1, 105	Piping, piping components	Concrete cylinder piping	Soil, concrete	Cracking, spalling, corrosion of rebar due to exposure of rebar	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C1.AP-253	3.3-1, 73	Piping, piping components	Concrete, cementitious material	Air – outdoor	Changes in material properties due to aggressive chemical attack	AMP XI.M36, "External Surfaces Monitoring of Mechanical	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components"	
M	VII.C1.AP-251	3.3-1, 74	Piping, piping components	Concrete, cementitious material	Air – outdoor	Cracking due to settling	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.C1.AP-252	3.3-1, 77	Piping, piping components	Concrete, cementitious material	Air – outdoor	Loss of material due to abrasion, cavitation, aggressive chemical attack, leaching	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.C1.AP-250	3.3-1, 30	Piping, piping components	Concrete, cementitious material	Raw Water	Changes in material properties due to aggressive chemical attack	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VII.C1.AP-248	3.3-1, 31	Piping, piping components	Concrete, cementitious material	Raw Water	Cracking due to settling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VII.C1.AP-249	3.3-1, 33	Piping, piping components	Concrete, cementitious material	Raw Water	Loss of material due to abrasion, cavitation, aggressive chemical attack, leaching	AMP XI.M20, "Open-Cycle Cooling Water System"	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.C1.AP-133	3.3-1, 99	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.C1.AP-196	3.3-1, 36	Piping, piping components	Copper alloy	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VII.C1.AP-174	3.3-1, 108	Piping, piping components	Copper Alloy	Soil, concrete	Loss of material due to general, pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C1.A-47	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.C1.A-743	3.3-1, 214	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.C1.AP-238	3.3-1, 30.2	Piping, piping components	Fiberglass	Raw water (internal)	Cracking, blistering, change in color due to water absorption	AMP XI.M20, "Open-Cycle Cooling Water System"	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.C1.AP-176	3.3-1, 104	Piping, piping components	Fiberglass	Soil	Cracking, blistering, change in color due to water absorption	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
N	VII.C1.A-462	3.3-1, 177	Piping, piping components	Fiberglass	Soil	Loss of material due to wear	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
N	VII.C1.A-456	3.3-1, 165	Piping, piping components	Gray cast iron	Air – indoor uncontrolled, air – outdoor, moist air, condensation, raw water, treated water, waste water (internal)	Loss of material due to general, pitting, crevice corrosion, MIC (raw water, waste water, and treated water environments only)	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.C1.A-51	3.3-1, 72	Piping, piping components	Gray cast iron	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.C1.A-02	3.3-1, 72	Piping, piping components	Gray cast iron	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.C1.AP-239	3.3-1, 30.2	Piping, piping components	HDPE	Raw water (internal)	Cracking, blistering, change in color due to water absorption	AMP XI.M20, "Open-Cycle Cooling Water System"	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.C1.AP-175	3.3-1, 104	Piping, piping components	HDPE	Soil, concrete	Cracking, blistering, change in color due to water absorption	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C1.AP-206	3.3-1, 34	Piping, piping components	Nickel alloy	Raw water	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
N	VII.C1.A-458	3.3-1, 172	Piping, piping components	PVC	Sunlight	Reduction in impact strength due to photolysis	Plant-specific aging management program	Yes
M	VII.C1.AP-156	3.3-1, 75	Piping, piping components	Reinforced concrete, asbestos cement	Air – outdoor	Cracking due to aggressive chemical attack and leaching; changes in material properties due to aggressive chemical attack	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.C1.AP-155	3.3-1, 32	Piping, piping components	Reinforced concrete, asbestos cement	Raw water	Cracking due to aggressive chemical attack and leaching; changes in material properties due to aggressive chemical attack	AMP XI.M20, "Open-Cycle Cooling Water System"	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.C1.AP-157	3.3-1, 103	Piping, piping components	Reinforced concrete, asbestos cement	Soil, concrete	Cracking due to aggressive chemical attack and leaching; changes in material properties due to aggressive chemical attack	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C1.AP-209	3.3-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.C1.AP-221	3.3-1, 6	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.C1.AP-138	3.3-1, 100	Piping, piping components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.C1.A-54	3.3-1, 40	Piping, piping components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.C1.A-425	3.3-1, 144	Piping, piping components	Stainless steel, aluminum	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C1.AP-137	3.3-1, 107	Piping, piping components	Stainless steel, nickel alloy	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C1.AP-127	3.3-1, 97	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.C1.AP-194	3.3-1, 37	Piping, piping components	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VII.C1.AP-198	3.3-1, 106	Piping, piping components	Steel (with coating or wrapping)	Soil, concrete	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C1.AP-172	3.3-1, 108	Piping, piping components	Super austenitic	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil	AMP XI.M41, "Buried and Underground Piping and	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						environment only)	Tanks"	
M	VII.C1.AP-171	3.3-1, 108	Piping, piping components	Titanium	Soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C1.AP-161	3.3-1, 123	Piping, piping components	Titanium (ASTM Grades 1, 2, 7, 11, or 12)	Raw water	None	None	No
N	VII.C1.A-742	3.3-1, 213	Piping, piping components (for components not covered by NRC GL 89-13)	Concrete, cementitious material	Raw Water	Changes in material properties due to aggressive chemical attack	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C1.A-740	3.3-1, 211	Piping, piping components (for components not covered by NRC GL 89-13)	Concrete, cementitious material	Raw Water	Cracking due to settling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C1.A-741	3.3-1, 212	Piping, piping components (for components	Concrete, cementitious material	Raw Water	Loss of material due to abrasion, cavitation, aggressive	AMP XI.M38, "Inspection of Internal Surfaces in	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			not covered by NRC GL 89-13)			chemical attack, leaching	Miscellaneous Piping and Ducting Components"	
N	VII.C1.A-738	3.3-1, 209	Piping, piping components (for components not covered by NRC GL 89-13)	Fiberglass	Raw water (internal)	Cracking, blistering, change in color due to water absorption	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C1.A-739	3.3-1, 210	Piping, piping components (for components not covered by NRC GL 89-13)	HDPE	Raw water (internal)	Cracking, blistering, change in color due to water absorption	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C1.A-737	3.3-1, 208	Piping, piping components (for components not covered by NRC GL 89-13)	Reinforced concrete, asbestos cement	Raw water	Cracking due to aggressive chemical attack and leaching; changes in material properties due to aggressive chemical attack	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C1.A-454	3.3-1, 158	Piping, piping components, heat exchanger components	Nickel alloy	Raw water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			(for components not covered by NRC GL 89-13)				Piping and Ducting Components"	
M	VII.C1.A-727	3.3-1, 134	Piping, piping components, heat exchanger components (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy	Raw water	Loss of material due to general (steel. copper alloy only), pitting, crevice corrosion, MIC; fouling that leads to corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.C1.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.C1.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil,	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
					fuel oil	coatings/linings		
N	VII.C1.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VII.C1.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	VII.C1.A-460	3.3-1, 175	Piping, piping components; tanks (for components not covered by NRC GL 89-13)	Fiberglass	Raw water	Cracking, blistering, change in color due to water absorption	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C1.A-461	3.3-1, 176	Piping, piping components; tanks (for components not covered by NRC GL 89-13)	Fiberglass	Raw water	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.C1.AP-75	3.3-1, 32.5	Seals, piping, piping components	Elastomer	Raw water	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.C1.AP-76	3.3-1, 32.5	Seals, piping, piping components	Elastomer	Raw water	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C1.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C1.A-457	3.3-1, 173	Seals, piping, piping components (for components not covered by NRC GL 89-13)	Elastomer	Raw water	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII AUXILIARY SYSTEMS
Table C1 Open-Cycle Cooling Water System (Service Water System)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.C1.A-459	3.3-1, 174	Seals, piping, piping components (for components not covered by NRC GL 89-13)	Elastomer	Raw water	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C1.A-714	3.3-1, 146	Underground piping, piping components; tanks	Stainless steel	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	VII.C1.A-405							

C2. CLOSED-CYCLE COOLING WATER SYSTEM

Systems, Structures, and Components

This section discusses the closed-cycle cooling water (CCCW) system, which consists of piping, radiation elements, temperature elements, heat exchangers, pumps, tanks, flow orifices, and valves, including containment isolation valves. The system contains chemically treated demineralized water. The CCCW system is designed to remove heat from various auxiliary structures and components (SCs) such as the chemical and volume control system (CVCS) and the spent fuel cooling system to the open-cycle cooling water (OCCW) system (VII.C1). A CCCW system is defined as part of the service water system that does not reject heat directly to a heat sink, has water chemistry control, and is not subject to significant sources of contamination.

Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components in the CCCW system are classified as Group C Quality Standards, with the exception of those forming part of the containment penetration boundary, which are Group B.

The aging management programs (AMPs) for the heat exchanger between the CCCW and the OCCW systems are addressed in the OCCW (VII.C1). The AMPs for the heat exchangers between the CCCW system and the interfacing auxiliary systems are included in the evaluations of their respective systems, such as those for the pressurized water reactor (PWR) and boiling water reactor (BWR) spent fuel pool (SFP) cooling and cleanup systems (VII.A3 and VII.A4, respectively) and the PWR CVCS (VII.E1).

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

AMPs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the CCCW system include the OCCW system (VII.C1), the PWR SFP cooling and cleanup system (VII.A3), the BWR SFP cooling and cleanup system (VII.A4), the PWR CVCS (VII.E1), the BWR reactor water cleanup (RWCU) system (VII.E3), the shutdown cooling (SDC) system (older BWR, VII.E4), the primary containment heating and ventilation system (VII.F3), fire protection (VII.G), the emergency diesel generator (EDG) system (VII.H2), the PWR containment spray system (V.A), the PWR and BWR emergency core cooling systems (V.D1 and V.D2), the PWR steam generator (SG) blowdown system (VIII.F), the condensate system (VIII.E), and the PWR auxiliary feedwater (AFW) system (VIII.G).

VII Table C2	AUXILIARY SYSTEMS Closed-Cycle Cooling Water System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VII.C2.AP-189	3.3-1, 46	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VII.C2.A-733	3.3-1, 204	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air (external), condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VII.C2.AP-205	3.3-1, 50	Heat exchanger tubes	Copper Alloy	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
	VII.C2.AP-188	3.3-1, 50	Heat exchanger tubes	Stainless steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.C2.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.C2.A-750	3.3-1, 221	Piping, piping components	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of	Yes

VII AUXILIARY SYSTEMS
Table C2 Closed-Cycle Cooling Water System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Mechanical Components"	
M	VII.C2.AP-254	3.3-1, 48	Piping, piping components	Aluminum	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.C2.AP-199	3.3-1, 46	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.C2.AP-133	3.3-1, 99	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.C2.AP-43	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.C2.A-743	3.3-1, 214	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.C2.AP-32	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.C2.A-456	3.3-1, 165	Piping, piping components	Gray cast iron	Air – indoor uncontrolled, air – outdoor, moist air,	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in	No

VII AUXILIARY SYSTEMS
Table C2 Closed-Cycle Cooling Water System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
					condensation, raw water, treated water, waste water (internal)	(raw water, waste water, and treated water environments only)	Miscellaneous Piping and Ducting Components"	
M	VII.C2.A-50	3.3-1, 72	Piping, piping components	Gray cast iron	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.C2.AP-31	3.3-1, 72	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.C2.AP-209	3.3-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.C2.AP-221	3.3-1, 6	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.C2.A-52	3.3-1, 49	Piping, piping components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.C2.AP-186	3.3-1, 43	Piping, piping components	Stainless steel	Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No

VII AUXILIARY SYSTEMS
Table C2 Closed-Cycle Cooling Water System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.C2.AP-138	3.3-1, 100	Piping, piping components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.C2.AP-127	3.3-1, 97	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
N	VII.C2.A-471	3.3-1, 147	Piping, piping components	Nickel alloy and nickel alloy cladding	Closed cycle cooling water, closed cycle cooling water >60°C (>140°F)	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VII.C2.A-473	3.3-1, 160	Piping, piping components, heat exchanger components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VII.C2.A-454	3.3-1, 158	Piping, piping components, heat exchanger components (for components not covered by NRC GL 89-13)	Nickel alloy	Raw water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII AUXILIARY SYSTEMS
Table C2 Closed-Cycle Cooling Water System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.C2.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.C2.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.C2.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VII.C2.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes

VII AUXILIARY SYSTEMS

Table C2 Closed-Cycle Cooling Water System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.C2.AP-202	3.3-1, 45	Piping, piping components; tanks	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.C2.AP-259	3.3-1, 85	Seals, piping, piping components	Elastomer	Closed-cycle cooling water	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C2.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C2.A-477	3.3-1, 173	Seals, piping, piping components	Elastomer	Treated water	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C2.A-714	3.3-1, 146	Underground piping, piping components; tanks	Stainless steel	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes

VII Table C2	AUXILIARY SYSTEMS Closed-Cycle Cooling Water System							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	VII.C2.A-405							
D	VII.C2.AP-257							

C3. ULTIMATE HEAT SINK

Systems, Structures, and Components

The ultimate heat sink (UHS) consists of a lake, ocean, river, spray pond, or cooling tower. The UHS provides sufficient cooling water for safe reactor shutdown and reactor cooldown via the residual heat removal (RHR) system or other similar system. Due to the varying configurations of connections to lakes, oceans, and rivers, a plant-specific aging management program (AMP) is required. Appropriate AMPs shall be provided to trend and project (i) deterioration of earthen dams and impoundments; (ii) rate of silt deposition; (iii) meteorological, climatological, and oceanic data since obtaining the Final Safety Analysis Report (FSAR) data; (iv) water level extremes for plants located on rivers; and (v) aging degradation of all upstream and downstream dams affecting the UHS.

The systems, structures, and components (SSCs) included in this section consist of piping, valves, and pumps. The cooling tower is addressed in this report on water-control structures (III.A6). The UHS absorbs heat from the RHR system or other similar system. Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," the piping and valves used for the UHS are governed by Group C Quality Standards.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The AMPs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the UHS include the open-cycle cooling water (OCCW) system (VII.C1) and the pressurized water reactor (PWR) and boiling water reactor (BWR) emergency core cooling systems (V.D1 and V.D2).

VII Table C3	AUXILIARY SYSTEMS Ultimate Heat Sink							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VII.C3.A-426	3.3-1, 145	Bolting	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
	VII.C3.AP-187	3.3-1, 42	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VII.C3.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.C3.A-750	3.3-1, 221	Piping, piping components	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.C3.AP-195	3.3-1, 34	Piping, piping components	Copper alloy	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No

VII Table C3 — AUXILIARY SYSTEMS — Ultimate Heat Sink

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.C3.A-47	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.C3.A-743	3.3-1, 214	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.C3.A-456	3.3-1, 165	Piping, piping components	Gray cast iron	Air – indoor uncontrolled, air – outdoor, moist air, condensation, raw water, treated water, waste water (internal)	Loss of material due to general, pitting, crevice corrosion, MIC (raw water, waste water, and treated water environments only)	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.C3.A-51	3.3-1, 72	Piping, piping components	Gray cast iron	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.C3.A-02	3.3-1, 72	Piping, piping components	Gray cast iron	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.C3.AP-206	3.3-1, 34	Piping, piping components	Nickel alloy	Raw water	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VII.C3.AP-209	3.3-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of	Yes

VII Table C3	AUXILIARY SYSTEMS Ultimate Heat Sink							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
							Mechanical Components"	
M	VII.C3.AP-221	3.3-1, 6	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.C3.A-53	3.3-1, 39	Piping, piping components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
N	VII.C3.A-425	3.3-1, 144	Piping, piping components	Stainless steel, aluminum	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C3.AP-137	3.3-1, 107	Piping, piping components	Stainless steel, nickel alloy	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C3.AP-194	3.3-1, 37	Piping, piping components	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No

VII Table C3	AUXILIARY SYSTEMS Ultimate Heat Sink							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VII.C3.AP-198	3.3-1, 106	Piping, piping components	Steel (with coating or wrapping)	Soil, concrete	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.C3.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.C3.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.C3.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes

VII Table C3 **AUXILIARY SYSTEMS Ultimate Heat Sink**

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.C3.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	VII.C3.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.C3.A-482	3.3-1, 186	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Air – outdoor, air – indoor controlled, air – indoor uncontrolled, raw water, waste water, condensation, soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VII.C3.A-756	3.3-1, 227	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Air (external)	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes
N	VII.C3.A-755	3.3-1, 226	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	No

VII Table C3 AUXILIARY SYSTEMS
Ultimate Heat Sink

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.C3.A-760	3.3-1, 231	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air – outdoor, air – indoor uncontrolled, air – indoor controlled, condensation	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VII.C3.A-757	3.3-1, 228	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air – outdoor, air – indoor uncontrolled, moist air, raw water, condensation	Loss of material due to pitting, crevice corrosion, MIC (raw water environment only)	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VII.C3.A-759	3.3-1, 230	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	VII.C3.A-758	3.3-1, 229	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Soil, ground water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M29, "Aboveground Metallic Tanks"	No
M	VII.C3.A-401	3.3-1, 128	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel	Soil, concrete, air – outdoor, air – indoor uncontrolled, moist air, raw water, condensation	Loss of material due to general, pitting, crevice corrosion, MIC (soil, raw water environments only)	AMP XI.M29, "Aboveground Metallic Tanks"	No

VII Table C3	AUXILIARY SYSTEMS Ultimate Heat Sink							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VII.C3.A-413	3.3-1, 137	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel, stainless steel, aluminum	Treated water, treated borated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	VII.C3.A-714	3.3-1, 146	Underground piping, piping components; tanks	Stainless steel	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	VII.C3.A-405							

D. COMPRESSED AIR SYSTEM

Systems, Structures, and Components

This section discusses the compressed air system, which consists of piping, valves (including containment isolation valves), air receivers, pressure regulators, filters, and dryers. The system components and piping are located in various buildings at most nuclear power plant (NPPs). Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components of the compressed air system are classified as Group D Quality Standards, with the exception of those forming part of the containment penetration boundary, which are Group B. However, the cleanliness of these components and high air quality is to be maintained because the air provides the motive power for instruments and active components (some of them safety-related) that may not function properly if nonsafety Group D equipment is contaminated.

With respect to filters, these items are to be addressed consistent with the U.S. Nuclear Regulatory Commission (NRC) position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of the Nuclear Energy Institute (NEI), dated March 10, 2000. Specifically, components that function as system filters are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review (AMR) under 10 CFR 54.21(a)(1)(ii). As part of the methodology description, the application should identify the standards that are relied on for replacement, for example, National Fire Protection Association (NFPA) standards for fire protection equipment.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an AMR.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

Various other systems discussed in this report may interface with the compressed air system.

VII Table D — AUXILIARY SYSTEMS — Compressed Air System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.D.AP-121	3.3-1, 12	Closure bolting	Steel; stainless steel	Condensation	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M18, "Bolting Integrity"	No
N	VII.D.A-733	3.3-1, 204	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air (external), condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.D.A-80	3.3-1, 78	Piping and components (External surfaces)	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.D.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.D.A-750	3.3-1, 221	Piping, piping components	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes

VII Table D	AUXILIARY SYSTEMS Compressed Air System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VII.D.AP-240	3.3-1, 54	Piping, piping components	Copper alloy	Condensation	Loss of material due to general, pitting, crevice corrosion	AMP XI.M24, "Compressed Air Monitoring"	No
N	VII.D.A-743	3.3-1, 214	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.D.A-456	3.3-1, 165	Piping, piping components	Gray cast iron	Air – indoor uncontrolled, air – outdoor, moist air, condensation, raw water, treated water, waste water (internal)	Loss of material due to general, pitting, crevice corrosion, MIC (raw water, waste water, and treated water environments only)	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.D.AP-209	3.3-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.D.AP-221	3.3-1, 6	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.D.AP-81	3.3-1, 56	Piping, piping components	Stainless steel	Condensation (internal)	Loss of material due to pitting, crevice corrosion	AMP XI.M24, "Compressed Air Monitoring"	No

VII Table D	AUXILIARY SYSTEMS Compressed Air System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VII.D.A-26	3.3-1, 55	Piping, piping components	Steel	Condensation (internal)	Loss of material due to general, pitting corrosion	AMP XI.M24, "Compressed Air Monitoring"	No
N	VII.D.A-495	3.3-1, 159	Piping, piping components, ducting and components	Fiberglass	Air – indoor (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.D.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.D.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No

VII Table D	AUXILIARY SYSTEMS Compressed Air System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VII.D.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VII.D.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	VII.D.A-729	3.3-1, 156	Seals, piping, piping components	Elastomer	Gas	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.D.A-498	3.3-1, 173	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.D.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous	No

VII Table D — AUXILIARY SYSTEMS Compressed Air System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Piping and Ducting Components"	
N	VII.D.A-714	3.3-1, 146	Underground piping, piping components; tanks	Stainless steel	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	VII.D.A-405							

E1. CHEMICAL AND VOLUME CONTROL SYSTEM (PRESSURIZED WATER REACTOR)

Systems, Structures, and Components

This section discusses a portion of the pressurized water reactor (PWR) chemical and volume control system (CVCS). The portion of the PWR CVCS covered in this section extends from the isolation valves associated with the reactor coolant pressure boundary (RCPB) (and Code change as discussed below) to the volume control tank. This portion of the PWR CVCS consists of high- and low-pressure piping and valves (including the containment isolation valves), regenerative and letdown heat exchangers, pumps, basket strainers, and the volume control tank. The system contains chemically treated borated water; the shell side of the letdown heat exchanger contains closed-cycle cooling water (CCCW) (treated water).

Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the CVCS are governed by Group C Quality Standards. Portions of the CVCS extending from the reactor coolant system (RCS) up to and including the isolation valves associated with RCPB are governed by Group A Quality Standards and covered in IV.C2.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the CVCS include the RCS (IV.C2), the emergency core cooling system (V.D1), the spent fuel pool (SFP) cooling system (VII.A3), and the CCCW system (VII.C2).

VII AUXILIARY SYSTEMS
Table E1 Chemical and Volume Control System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.E1.A-439	3.3-1, 193	Any	Steel	Treated water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
	VII.E1.A-79	3.3-1, 9	External surfaces	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	VII.E1.AP-203	3.3-1, 46	Heat exchanger components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
	VII.E1.AP-65	3.3-1, 72	Heat exchanger components	Copper alloy (>15% Zn or >8% Al)	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
	VII.E1.AP-118	3.3-1, 20	Heat exchanger components	Stainless steel	Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.E1.AP-189	3.3-1, 46	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.E1.A-100	3.3-1, 2	Heat exchanger components and tubes	Stainless steel	Treated borated water	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
	VII.E1.AP-119	3.3-1, 8	Heat exchanger components and tubes	Stainless steel	Treated borated water >60°C (>140°F)	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection,	No

VII AUXILIARY SYSTEMS
Table E1 Chemical and Volume Control System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Subsections IWB, IWC, and IWD"	
M	VII.E1.A-69	3.3-1, 3	Heat exchanger components, non-regenerative	Stainless steel	Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking; cyclic loading	AMP XI.M2, "Water Chemistry"	Yes
	VII.E1.A-101	3.3-1, 17	Heat exchanger tubes	Stainless steel	Treated borated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
	VII.E1.AP-115	3.3-1, 7	High-pressure pump, casing	Stainless steel	Treated borated water	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No
	VII.E1.AP-114	3.3-1, 18	High-pressure pump, casing	Stainless steel	Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
	VII.E1.AP-122	3.3-1, 11	High-pressure pump, closure bolting	Steel, high-strength	Air with steam or water leakage	Cracking due to stress corrosion cracking; cyclic loading	AMP XI.M18, "Bolting Integrity"	No

VII AUXILIARY SYSTEMS
Table E1 Chemical and Volume Control System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.E1.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.E1.A-750	3.3-1, 221	Piping, piping components	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.E1.AP-1	3.3-1, 9	Piping, piping components	Aluminum	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	VII.E1.A-407	3.3-1, 126	Piping, piping components	Any	Treated borated water	Wall thinning due to erosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	VII.E1.AP-199	3.3-1, 46	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.E1.AP-133	3.3-1, 99	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No

VII AUXILIARY SYSTEMS
Table E1 Chemical and Volume Control System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.E1.AP-43	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.E1.AP-31	3.3-1, 72	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.E1.AP-209	3.3-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.E1.AP-221	3.3-1, 6	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.E1.AP-138	3.3-1, 100	Piping, piping components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.E1.A-57	3.3-1, 2	Piping, piping components	Stainless steel	Treated borated water	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	VII.E1.A-103	3.3-1, 124	Piping, piping components	Stainless steel	Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32,	No

VII AUXILIARY SYSTEMS
Table E1 Chemical and Volume Control System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							"One-Time Inspection"	
M	VII.E1.A-34	3.3-1, 2	Piping, piping components	Steel	Air – indoor uncontrolled	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	VII.E1.AP-127	3.3-1, 97	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.E1.A-88	3.3-1, 29	Piping, piping components	Steel (with stainless steel cladding); stainless steel	Treated borated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VII.E1.AP-79	3.3-1, 125	Piping, piping components	Steel (with stainless steel cladding); stainless steel	Treated borated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
N	VII.E1.A-722	3.3-1, 157	Piping, piping components, heat exchanger components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting	No

VII AUXILIARY SYSTEMS
Table E1 Chemical and Volume Control System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components"	
M	VII.E1.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.E1.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.E1.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes

VII AUXILIARY SYSTEMS
Table E1 Chemical and Volume Control System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.E1.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	VII.E1.AP-82	3.3-1, 28	Piping, piping components; tanks	Stainless steel	Treated borated water	Cracking due to stress corrosion cracking, MIC	Plant-specific aging management program	Yes
N	VII.E1.A-504	3.3-1, 156	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E1.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E1.A-714	3.3-1, 146	Underground piping, piping components; tanks	Stainless steel	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	VII.E1.A-102							

VII AUXILIARY SYSTEMS
Table E1 Chemical and Volume Control System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	VII.E1.A-405							
D	VII.E1.AP-85							

E2. STANDBY LIQUID CONTROL SYSTEM (BOILING WATER REACTOR)

Systems, Structures, and Components

This section discusses the portion of the standby liquid control (SLC) system extending from the containment isolation valve to the solution storage tank. The system serves as a backup reactivity control system in all boiling water reactors (BWRs). The major components of this system are the piping, the solution storage tank, the solution storage tank heaters, valves, and pumps. All of the components from the storage tank to the explosive actuated discharge valve operate in contact with a sodium pentaborate (Na2B10O16•10H2O) solution.

Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the SLC system are governed by Group B Quality Standards. The portions of the SLC system extending from the reactor coolant pressure boundary (RCPB) up to and including the containment isolation valves are governed by Group A Quality Standards and are covered in IV.C1.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The system that interfaces with the SLC system is the BWR reactor pressure vessel (IV.A1). If used, the SLC system would inject sodium pentaborate solution into the pressure vessel near the bottom of the reactor core.

VII AUXILIARY SYSTEMS
Table E2 Standby Liquid Control System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.E2.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.E2.AP-141	3.3-1, 203	Piping, piping components	Stainless steel	Sodium pentaborate solution	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VII.E2.AP-181	3.3-1, 18	Piping, piping components	Stainless steel	Sodium pentaborate solution >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VII.E2.A-722	3.3-1, 157	Piping, piping components, heat exchanger components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.E2.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion;	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components,	No

VII AUXILIARY SYSTEMS
Table E2 Standby Liquid Control System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			coatings/linings		water, lubricating oil, waste water	cracking due to stress corrosion cracking	Heat Exchangers, and Tanks"	
M	VII.E2.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.E2.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VII.E2.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	VII.E2.A-504	3.3-1, 156	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting	No

VII AUXILIARY SYSTEMS
Table E2 Standby Liquid Control System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components"	
N	VII.E2.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
D	VII.E2.A-405							

E3. REACTOR WATER CLEANUP SYSTEM (BOILING WATER REACTOR)

Systems, Structures, and Components

This section discusses the reactor water cleanup (RWCU) system, which provides for cleanup and particulate removal from the recirculating reactor coolant in all boiling water reactors (BWRs). Some plants may not include the RWCU system in the scope of license renewal, while other plants may include the RWCU system because it is associated with safety-related functions.

Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” the portion of the RWCU system extending from the reactor coolant recirculation system up to and including the containment isolation valves are covered in IV.C1. The remainder of the system outboard of the isolation valves is governed by Group C Quality Standards. In this table, only aging management programs (AMPs) for RWCU-related piping and components outboard of the isolation valves are evaluated. The AMP for containment isolation valves in the RWCU system is evaluated in IV.C1, which concerns the reactor coolant pressure boundary (RCPB) in BWRs.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The AMPs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the BWR RWCU system include the RCPB (IV.C1), the closed-cycle cooling water (CCCW) system (VII.C2), and the condensate system (VIII.E).

VII Table E3 — AUXILIARY SYSTEMS — Reactor Water Cleanup System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.E3.A-439	3.3-1, 193	Any	Steel	Treated water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
M	VII.E3.AP-191	3.3-1, 47	Heat exchanger components	Stainless steel; steel with stainless steel cladding	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
	VII.E3.AP-192	3.3-1, 44	Heat exchanger components	Stainless steel; steel with stainless steel cladding	Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No
	VII.E3.AP-112	3.3-1, 20	Heat exchanger components	Stainless steel; steel with stainless steel cladding	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.E3.AP-189	3.3-1, 46	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No
	VII.E3.AP-188	3.3-1, 50	Heat exchanger tubes	Stainless steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No

VII Table E3 — AUXILIARY SYSTEMS
Reactor Water Cleanup System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.E3.AP-139	3.3-1, 27	Heat exchanger tubes	Stainless steel	Treated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.E3.AP-130	3.3-1, 25	Piping	Aluminum	Treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.E3.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.E3.A-408	3.3-1, 126	Piping, piping components	Any	Treated water	Wall thinning due to erosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	VII.E3.AP-199	3.3-1, 46	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.E3.AP-140	3.3-1, 22	Piping, piping components	Copper alloy	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32,	No

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							"One-Time Inspection"	
M	VII.E3.AP-43	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.E3.AP-32	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.E3.AP-31	3.3-1, 72	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.E3.AP-186	3.3-1, 43	Piping, piping components	Stainless steel	Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.E3.A-62	3.3-1, 2	Piping, piping components	Stainless steel	Treated water	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	VII.E3.AP-110	3.3-1, 203	Piping, piping components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VII.E3.A-34	3.3-1, 2	Piping, piping components	Steel	Air – indoor uncontrolled	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes

VII Table E3 — AUXILIARY SYSTEMS — Reactor Water Cleanup System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.E3.AP-106	3.3-1, 21	Piping, piping components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.E3.AP-283	3.3-1, 16	Piping, piping components outboard the second containment isolation valves with a diameter ≥4 inches nominal pipe size	Stainless steel	Treated water >93°C (>200°F)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M25, "BWR Reactor Water Cleanup System"	No
N	VII.E3.A-722	3.3-1, 157	Piping, piping components, heat exchanger components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.E3.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No

VII Table E3 — AUXILIARY SYSTEMS — Reactor Water Cleanup System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.E3.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.E3.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VII.E3.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
	VII.E3.AP-120	3.3-1, 19	Regenerative heat exchanger components	Stainless steel	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VII.E3.A-504	3.3-1, 156	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous	No

VII Table E3 — AUXILIARY SYSTEMS — Reactor Water Cleanup System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Piping and Ducting Components"	
N	VII.E3.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
D	VII.E3.A-405							

E4. SHUTDOWN COOLING SYSTEM (OLDER BOILING WATER REACTOR)

Systems, Structures, and Components

This section discusses the shutdown cooling (SDC) system for older vintage boiling water reactors (BWRs) and consists of piping and fittings, the SDC system pump, the heat exchanger, and valves.

Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the SDC system are governed by Group B Quality Standards. Portions of the SDC system extending from the reactor coolant pressure boundary (RCPB) up to and including the containment isolation valves are governed by Group A Quality Standards and are covered in IV.C1.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the SDC system include the reactor coolant pressure boundary (RCPB) (IV.C1) and the closed-cycle cooling water (CCCW) system (VII.C2).

VII Table E4	AUXILIARY SYSTEMS Shutdown Cooling System (Older BWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VII.E4.A-532	3.3-1, 193	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
M	VII.E4.AP-191	3.3-1, 47	Heat exchanger components	Stainless steel; steel with stainless steel cladding	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.E4.AP-189	3.3-1, 46	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No
	VII.E4.AP-188	3.3-1, 50	Heat exchanger tubes	Stainless steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.E4.AP-130	3.3-1, 25	Piping	Aluminum	Treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.E4.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No

VII AUXILIARY SYSTEMS
Table E4 Shutdown Cooling System (Older BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.E4.A-750	3.3-1, 221	Piping, piping components	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.E4.AP-199	3.3-1, 46	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.E4.AP-133	3.3-1, 99	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.E4.AP-140	3.3-1, 22	Piping, piping components	Copper alloy	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.E4.AP-43	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.E4.A-743	3.3-1, 214	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.E4.AP-32	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No

VII AUXILIARY SYSTEMS
Table E4 Shutdown Cooling System (Older BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.E4.AP-31	3.3-1, 72	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.E4.AP-209	3.3-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.E4.AP-221	3.3-1, 6	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.E4.AP-186	3.3-1, 43	Piping, piping components	Stainless steel	Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.E4.AP-138	3.3-1, 100	Piping, piping components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.E4.A-62	3.3-1, 2	Piping, piping components	Stainless steel	Treated water	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	VII.E4.AP-110	3.3-1, 203	Piping, piping components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion,	Plant-specific aging management	Yes

VII Table E4 AUXILIARY SYSTEMS
Shutdown Cooling System (Older BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						MIC	program	
M	VII.E4.A-61	3.3-1, 110	Piping, piping components	Stainless steel	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	AMP XI.M7, "BWR Stress Corrosion Cracking," and AMP XI.M2, "Water Chemistry"	Yes
M	VII.E4.AP-127	3.3-1, 97	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.E4.AP-106	3.3-1, 21	Piping, piping components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VII.E4.A-722	3.3-1, 157	Piping, piping components, heat exchanger components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII AUXILIARY SYSTEMS
Table E4 Shutdown Cooling System (Older BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.E4.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.E4.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.E4.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VII.E4.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes

VII AUXILIARY SYSTEMS
Table E4 Shutdown Cooling System (Older BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.E4.A-504	3.3-1, 156	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E4.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E4.A-714	3.3-1, 146	Underground piping, piping components; tanks	Stainless steel	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	VII.E4.A-405							

E5. WASTE WATER SYSTEMS

Systems, Structures, and Components

This section discusses liquid waste systems such as liquid radioactive waste systems, oily waste systems, floor drainage systems, chemical waste water systems, and secondary waste water systems. Plants may include portions of waste water systems within the scope of license renewal based on the criterion of 10CFR 54.4.(a)(2).

Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," radioactive-waste-containing portions of waste water systems are classified as Group C Quality Standards, with the exception of those forming part of the containment pressure boundary, which is classified as Group B. Waste water systems that do not contain radioactive waste or form a part of the containment pressure boundary are classified as Group D.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

Various other systems discussed in this report may interface with waste water systems.

VII Table E5	AUXILIARY SYSTEMS Waste Water Systems							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VII.E5.A-469	3.3-1, 193	Any	Steel	Waste water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
N	VII.E5.A-426	3.3-1, 145	Bolting	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
	VII.E5.AP-276	3.3-1, 95	Heat exchanger components	Nickel alloy	Waste Water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VII.E5.AP-275	3.3-1, 95	Heat exchanger components	Stainless steel	Waste Water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.E5.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers,	No

VII Table E5 — AUXILIARY SYSTEMS — Waste Water Systems

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							and Tanks"	
M	VII.E5.AP-271	3.3-1, 93	Piping, piping components	Copper alloy	Raw water (potable)	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.E5.AP-272	3.3-1, 95	Piping, piping components	Copper alloy	Waste water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E5.A-743	3.3-1, 214	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.E5.A-462	3.3-1, 177	Piping, piping components	Fiberglass	Soil	Loss of material due to wear	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
N	VII.E5.A-456	3.3-1, 165	Piping, piping components	Gray cast iron	Air – indoor uncontrolled, air – outdoor, moist air,	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in	No

VII Table E5	AUXILIARY SYSTEMS Waste Water Systems							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
					condensation, raw water, treated water, waste water (internal)	(raw water, waste water, and treated water environments only)	Miscellaneous Piping and Ducting Components"	
N	VII.E5.A-547	3.3-1, 72	Piping, piping components	Gray cast iron, copper alloy (>15% Zn or >8% Al)	Waste water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.E5.AP-274	3.3-1, 95	Piping, piping components	Nickel alloy	Condensation (internal)	Loss of material due to pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E5.A-458	3.3-1, 172	Piping, piping components	PVC	Sunlight	Reduction in impact strength due to photolysis	Plant-specific aging management program	Yes
M	VII.E5.AP-273	3.3-1, 95	Piping, piping components	Stainless steel	Condensation (internal)	Loss of material due to pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII Table E5 — AUXILIARY SYSTEMS — Waste Water Systems

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.E5.A-425	3.3-1, 144	Piping, piping components	Stainless steel, aluminum	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.E5.AP-270	3.3-1, 88	Piping, piping components	Steel; stainless steel	Raw water (potable)	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.E5.A-724	3.3-1, 72	Piping, piping components, heat exchanger components	Gray cast iron, copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.E5.A-495	3.3-1, 159	Piping, piping components, ducting and components	Fiberglass	Air – indoor (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E5.A-722	3.3-1, 157	Piping, piping components, heat exchanger components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting	No

VII AUXILIARY SYSTEMS
Table E5 Waste Water Systems

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components"	
M	VII.E5.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.E5.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.E5.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes

VII Table E5	AUXILIARY SYSTEMS Waste Water Systems							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VII.E5.A-551	3.3-1, 175	Piping, piping components; tanks	Fiberglass	Waste water	Cracking, blistering, change in color due to water absorption	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E5.A-552	3.3-1, 176	Piping, piping components; tanks	Fiberglass	Waste water	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.E5.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	VII.E5.AP-279	3.3-1, 95	Piping, piping components; tanks	Nickel alloy	Waste water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E5.A-537	3.3-1, 194	Piping, piping components; tanks	PVC	Soil, concrete	Loss of material due to wear	AMP XI.M41, "Buried and Underground Piping and Tanks"	No

VII Table E5	**AUXILIARY SYSTEMS Waste Water Systems**							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VII.E5.A-721	3.3-1, 155	Piping, piping components; tanks	Stainless steel	Waste water greater than 140° F	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.E5.AP-278	3.3-1, 95	Piping, piping components; tanks	Stainless steel, aluminum	Waste water	Loss of material due to pitting, crevice corrosion, MIC (stainless steel only)	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.E5.AP-280	3.3-1, 95	Piping, piping components; tanks	Steel	Condensation (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.E5.AP-281	3.3-1, 91	Piping, piping components; tanks	Steel	Waste water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII Table E5	AUXILIARY SYSTEMS Waste Water Systems							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	VII.E5.A-411	3.3-1, 135	Pump casings	Stainless steel	Waste water (internal and external)	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
	VII.E5.A-410	3.3-1, 135	Pump casings	Steel	Waste water (internal and external)	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.E5.A-504	3.3-1, 156	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E5.A-728	3.3-1, 156	Seals, piping, piping components	Elastomer	Waste water	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E5.A-550	3.3-1, 174	Seals, piping, piping components	Elastomer	Waste water	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous	No

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Piping and Ducting Components"	
N	VII.E5.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E5.A-548	3.3-1, 173	Seals, piping, piping components	Elastomer	Waste water	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.E5.A-482	3.3-1, 186	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Air – outdoor, air – indoor controlled, air – indoor uncontrolled, raw water, waste water, condensation, soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VII.E5.A-756	3.3-1, 227	Tanks within the scope of AMP XI.M29, "Aboveground	Aluminum	Air (external)	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes

VII Table E5	AUXILIARY SYSTEMS Waste Water Systems							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			Metallic Tanks"					
N	VII.E5.A-755	3.3-1, 226	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	VII.E5.A-760	3.3-1, 231	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air – outdoor, air – indoor uncontrolled, air – indoor controlled, condensation	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VII.E5.A-757	3.3-1, 228	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air – outdoor, air – indoor uncontrolled, moist air, raw water, condensation	Loss of material due to pitting, crevice corrosion, MIC (raw water environment only)	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VII.E5.A-759	3.3-1, 230	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	VII.E5.A-758	3.3-1, 229	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Soil, ground water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M29, "Aboveground Metallic Tanks"	No

VII Table E5	AUXILIARY SYSTEMS Waste Water Systems							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VII.E5.A-401	3.3-1, 128	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel	Soil, concrete, air – outdoor, air – indoor uncontrolled, moist air, raw water, condensation	Loss of material due to general, pitting, crevice corrosion, MIC (soil, raw water environments only)	AMP XI.M29, "Aboveground Metallic Tanks"	No
M	VII.E5.A-413	3.3-1, 137	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel, stainless steel, aluminum	Treated water, treated borated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M29, "Aboveground Metallic Tanks"	No
D	VII.E5.A-405							

F1. CONTROL ROOM AREA VENTILATION SYSTEM

Systems, Structures, and Components

This section discusses the control room area ventilation system (with warm moist air as the normal environment), which contains ducts, piping and fittings, equipment frames and housings, flexible collars and seals, filters, and heating and cooling air handlers. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the control room area ventilation system are governed by Group B Quality Standards.

With respect to filters and seals, these items are to be addressed consistent with the U.S. Nuclear Regulatory Commission (NRC) position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of the Nuclear Energy Institute (NEI), dated March 10, 2000. Specifically, components that function as system filters and seals are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review (AMR) under 10 CFR 54.21(a)(1)(ii). As part of the methodology description, the application should identify the standards that are relied on for replacement, for example, National Fire Protection Association (NFPA) standards for fire protection equipment.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The system that interfaces with the control room area ventilation system is the auxiliary and radwaste area ventilation system (VII.F2). The cooling coils receive their cooling water from other systems, such as the hot water heating system or the chilled water cooling system.

VII AUXILIARY SYSTEMS
Table F1 Control Room Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.F1.AP-99	3.3-1, 94	Ducting and components	Stainless steel	Condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F1.A-10	3.3-1, 78	Ducting and components (External surfaces)	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
	VII.F1.A-08	3.3-1, 90	Ducting and components (Internal surfaces)	Steel	Condensation (Internal)	Loss of material due to general, pitting, crevice corrosion, (for drip pans and drain lines) MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F1.A-105	3.3-1, 78	Ducting; closure bolting	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.F1.AP-203	3.3-1, 46	Heat exchanger components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No

VII AUXILIARY SYSTEMS
Table F1 Control Room Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.F1.A-565	3.3-1, 161	Heat exchanger components	Copper alloy	Condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VII.F1.AP-65	3.3-1, 72	Heat exchanger components	Copper alloy (>15% Zn or >8% Al)	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
	VII.F1.AP-41	3.3-1, 80	Heat exchanger components	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.F1.AP-189	3.3-1, 46	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VII.F1.A-418	3.3-1, 96.4	Heat exchanger components (for components not covered by NRC GL 89-13)	Stainless steel, aluminum	Condensation	Loss of material due to pitting, crevice corrosion; fouling that leads to corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII AUXILIARY SYSTEMS
Table F1 Control Room Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.F1.A-417	3.3-1, 96.4	Heat exchanger components (for components not covered by NRC GL 89-13)	Steel, copper alloy	Condensation	Loss of material due to general, pitting, crevice corrosion; fouling that leads to corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.F1.A-733	3.3-1, 204	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air (external), condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VII.F1.AP-205	3.3-1, 50	Heat exchanger tubes	Copper Alloy	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
	VII.F1.AP-204	3.3-1, 50	Heat exchanger tubes	Steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VII.F1.A-419	3.3-1, 96.2	Heat exchanger tubes (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy, aluminum	Condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII AUXILIARY SYSTEMS
Table F1 Control Room Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.F1.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.F1.A-750	3.3-1, 221	Piping, piping components	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.F1.AP-142	3.3-1, 92	Piping, piping components	Aluminum	Condensation (internal)	Loss of material due to pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F1.AP-199	3.3-1, 46	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.F1.AP-43	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No

VII AUXILIARY SYSTEMS
Table F1 Control Room Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.F1.AP-31	3.3-1, 72	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.F1.AP-209	3.3-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.F1.AP-221	3.3-1, 6	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
N	VII.F1.A-748	3.3-1, 219	Piping, piping components	Stainless steel	Steam	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VII.F1.A-567	3.3-1, 170	Piping, piping components	Stainless steel	Steam	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.F1.AP-127	3.3-1, 97	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time	No

VII AUXILIARY SYSTEMS
Table F1 Control Room Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Inspection"	
N	VII.F1.A-566	3.3-1, 169	Piping, piping components	Steel, copper alloy	Steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VII.F1.A-495	3.3-1, 159	Piping, piping components, ducting and components	Fiberglass	Air – indoor (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.F1.A-722	3.3-1, 157	Piping, piping components, heat exchanger components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F1.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat	No

VII AUXILIARY SYSTEMS
Table F1 Control Room Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						stress corrosion cracking	Exchangers, and Tanks"	
M	VII.F1.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.F1.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VII.F1.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	VII.F1.AP-202	3.3-1, 45	Piping, piping components; tanks	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No

VII AUXILIARY SYSTEMS
Table F1 Control Room Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.F1.AP-103	3.3-1, 96	Seals, piping, piping components	Elastomer	Air – indoor uncontrolled (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F1.AP-102	3.3-1, 76	Seals, piping, piping components	Elastomer	Air – indoor uncontrolled (internal/external), air-indoor controlled, outdoor air, dry air, air with borated water leakage	Hardening and loss of strength due to elastomer degradation	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.F1.A-504	3.3-1, 156	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.F1.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII AUXILIARY SYSTEMS
Table F1 Control Room Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.F1.A-714	3.3-1, 146	Underground piping, piping components; tanks	Stainless steel	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	VII.F1.A-405							
D	VII.F1.AP-109							
D	VII.F1.AP-113							

F2. AUXILIARY AND RADWASTE AREA VENTILATION SYSTEM

Systems, Structures, and Components

This section discusses the auxiliary and radwaste area ventilation systems (with warm moist air as the normal environment) and contains ducts, piping and fittings, equipment frames and housings, flexible collars and seals, filters, and heating and cooling air handlers. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the auxiliary and radwaste area ventilation system are governed by Group B Quality Standards.

With respect to filters and seals, these items are to be addressed consistent with the U.S. Nuclear Regulatory Commission (NRC) position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of the Nuclear Energy Institute (NEI), dated March 10, 2000. Specifically, components that function as system filters and seals are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review (AMR) under 10 CFR 54.21(a)(1)(ii). As part of the methodology description, the application should identify the standards that are relied on for replacement, for example, National Fire Protection Association (NFPA) standards for fire protection equipment.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the auxiliary and radwaste area ventilation system are the control room area ventilation system (VII.F1) and the diesel generator building ventilation system (VII.F4). The cooling coils receive their cooling water from other systems, such as the hot water heating system or the chilled water cooling system.

VII AUXILIARY SYSTEMS
Table F2 Auxiliary and Radwaste Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.F2.AP-99	3.3-1, 94	Ducting and components	Stainless steel	Condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F2.A-10	3.3-1, 78	Ducting and components (External surfaces)	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
	VII.F2.A-08	3.3-1, 90	Ducting and components (Internal surfaces)	Steel	Condensation (Internal)	Loss of material due to general, pitting, crevice corrosion, (for drip pans and drain lines) MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F2.A-105	3.3-1, 78	Ducting; closure bolting	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.F2.A-565	3.3-1, 161	Heat exchanger components	Copper alloy	Condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous	No

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Piping and Ducting Components"	
	VII.F2.AP-41	3.3-1, 80	Heat exchanger components	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.F2.AP-189	3.3-1, 46	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VII.F2.A-418	3.3-1, 96.4	Heat exchanger components (for components not covered by NRC GL 89-13)	Stainless steel, aluminum	Condensation	Loss of material due to pitting, crevice corrosion; fouling that leads to corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.F2.A-417	3.3-1, 96.4	Heat exchanger components (for components not covered by NRC GL 89-13)	Steel, copper alloy	Condensation	Loss of material due to general, pitting, crevice corrosion; fouling that leads to corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII AUXILIARY SYSTEMS
Table F2 Auxiliary and Radwaste Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.F2.A-733	3.3-1, 204	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air (external), condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VII.F2.AP-205	3.3-1, 50	Heat exchanger tubes	Copper Alloy	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
	VII.F2.AP-204	3.3-1, 50	Heat exchanger tubes	Steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VII.F2.A-419	3.3-1, 96.2	Heat exchanger tubes (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy, aluminum	Condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F2.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No

VII Table F2	AUXILIARY SYSTEMS Auxiliary and Radwaste Area Ventilation System							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.F2.A-750	3.3-1, 221	Piping, piping components	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.F2.AP-142	3.3-1, 92	Piping, piping components	Aluminum	Condensation (internal)	Loss of material due to pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F2.AP-199	3.3-1, 46	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.F2.AP-43	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.F2.AP-31	3.3-1, 72	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.F2.AP-209	3.3-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes

VII Table F2	AUXILIARY SYSTEMS Auxiliary and Radwaste Area Ventilation System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VII.F2.AP-221	3.3-1, 6	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
N	VII.F2.A-748	3.3-1, 219	Piping, piping components	Stainless steel	Steam	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VII.F2.A-567	3.3-1, 170	Piping, piping components	Stainless steel	Steam	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.F2.AP-127	3.3-1, 97	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
N	VII.F2.A-566	3.3-1, 169	Piping, piping components	Steel, copper alloy	Steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

VII AUXILIARY SYSTEMS
Table F2 Auxiliary and Radwaste Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.F2.A-495	3.3-1, 159	Piping, piping components, ducting and components	Fiberglass	Air – indoor (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.F2.A-722	3.3-1, 157	Piping, piping components, heat exchanger components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F2.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.F2.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers,	No

VII AUXILIARY SYSTEMS
Table F2 Auxiliary and Radwaste Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						for cementitious coatings/linings	and Tanks"	
N	VII.F2.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VII.F2.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	VII.F2.AP-202	3.3-1, 45	Piping, piping components; tanks	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.F2.AP-103	3.3-1, 96	Seals, piping, piping components	Elastomer	Air – indoor uncontrolled (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F2.AP-102	3.3-1, 76	Seals, piping, piping components	Elastomer	Air – indoor uncontrolled (internal/external), air-indoor controlled,	Hardening and loss of strength due to elastomer degradation	AMP XI.M36, "External Surfaces Monitoring of Mechanical	No

VII AUXILIARY SYSTEMS
Table F2 Auxiliary and Radwaste Area Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
					outdoor air, dry air, air with borated water leakage		Components"	
N	VII.F2.A-504	3.3-1, 156	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.F2.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.F2.A-714	3.3-1, 146	Underground piping, piping components; tanks	Stainless steel	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	VII.F2.A-405							
D	VII.F2.AP-109							
D	VII.F2.AP-113							

F3. PRIMARY CONTAINMENT HEATING AND VENTILATION SYSTEM

Systems, Structures, and Components

This section discusses the primary containment heating and ventilation system (with warm moist air as the normal environment), which contains ducts, piping and fittings, equipment frames and housings, flexible collars and seals, filters, and heating and cooling air handlers. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the primary containment heating and ventilation system are governed by Group C Quality Standards.

With respect to filters and seals, these items are to be addressed consistent with the U.S. Nuclear Regulatory Commission (NRC) position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of the Nuclear Energy Institute (NEI), dated March 10, 2000. Specifically, components that function as system filters and seals are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review (AMR) under 10 CFR 54.21(a)(1)(ii). As part of the methodology description, the application should identify the standards that are relied on for replacement, for example, National Fire Protection Association (NFPA) standards for fire protection equipment.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the primary containment heating and ventilation system are the closed-cycle cooling water (CCCW) system (VII.C2) and the pressurized water reactor (PWR) and boiling water reactor (BWR) containments (II.A and II.B, respectively). The cooling coils receive their cooling water from other systems, such as the hot water heating system or the chilled water cooling system.

VII AUXILIARY SYSTEMS
Table F3 Primary Containment Heating and Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.F3.AP-99	3.3-1, 94	Ducting and components	Stainless steel	Condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F3.A-10	3.3-1, 78	Ducting and components (External surfaces)	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
	VII.F3.A-08	3.3-1, 90	Ducting and components (Internal surfaces)	Steel	Condensation (Internal)	Loss of material due to general, pitting, crevice corrosion, (for drip pans and drain lines) MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F3.A-105	3.3-1, 78	Ducting; closure bolting	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.F3.AP-203	3.3-1, 46	Heat exchanger components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No

VII AUXILIARY SYSTEMS
Table F3 Primary Containment Heating and Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.F3.A-565	3.3-1, 161	Heat exchanger components	Copper alloy	Condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VII.F3.AP-65	3.3-1, 72	Heat exchanger components	Copper alloy (>15% Zn or >8% Al)	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
	VII.F3.AP-41	3.3-1, 80	Heat exchanger components	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.F3.AP-189	3.3-1, 46	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VII.F3.A-418	3.3-1, 96.4	Heat exchanger components (for components not covered by NRC GL 89-13)	Stainless steel, aluminum	Condensation	Loss of material due to pitting, crevice corrosion; fouling that leads to corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII AUXILIARY SYSTEMS
Table F3 Primary Containment Heating and Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.F3.A-417	3.3-1, 96.4	Heat exchanger components (for components not covered by NRC GL 89-13)	Steel, copper alloy	Condensation	Loss of material due to general, pitting, crevice corrosion; fouling that leads to corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.F3.A-733	3.3-1, 204	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air (external), condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VII.F3.AP-205	3.3-1, 50	Heat exchanger tubes	Copper Alloy	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
	VII.F3.AP-204	3.3-1, 50	Heat exchanger tubes	Steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VII.F3.A-419	3.3-1, 96.2	Heat exchanger tubes (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy, aluminum	Condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII Table F3	AUXILIARY SYSTEMS Primary Containment Heating and Ventilation System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VII.F3.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.F3.AP-142	3.3-1, 92	Piping, piping components	Aluminum	Condensation (internal)	Loss of material due to pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F3.AP-199	3.3-1, 46	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.F3.AP-43	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.F3.A-50	3.3-1, 72	Piping, piping components	Gray cast iron	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.F3.A-748	3.3-1, 219	Piping, piping components	Stainless steel	Steam	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32,	No

VII AUXILIARY SYSTEMS
Table F3 Primary Containment Heating and Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							"One-Time Inspection"	
N	VII.F3.A-567	3.3-1, 170	Piping, piping components	Stainless steel	Steam	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.F3.AP-127	3.3-1, 97	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
N	VII.F3.A-566	3.3-1, 169	Piping, piping components	Steel, copper alloy	Steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VII.F3.A-495	3.3-1, 159	Piping, piping components, ducting and components	Fiberglass	Air – indoor (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII AUXILIARY SYSTEMS
Table F3 Primary Containment Heating and Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.F3.A-722	3.3-1, 157	Piping, piping components, heat exchanger components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F3.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.F3.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.F3.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and	Yes

VII AUXILIARY SYSTEMS
Table F3 Primary Containment Heating and Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Ducting Components"	
M	VII.F3.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	VII.F3.AP-202	3.3-1, 45	Piping, piping components; tanks	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.F3.AP-103	3.3-1, 96	Seals, piping, piping components	Elastomer	Air – indoor uncontrolled (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F3.AP-102	3.3-1, 76	Seals, piping, piping components	Elastomer	Air – indoor uncontrolled (internal/external), air-indoor controlled, outdoor air, dry air, air with borated water leakage	Hardening and loss of strength due to elastomer degradation	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.F3.A-504	3.3-1, 156	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in	No

VII AUXILIARY SYSTEMS
Table F3 Primary Containment Heating and Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Miscellaneous Piping and Ducting Components"	
N	VII.F3.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
D	VII.F3.A-405							
D	VII.F3.AP-109							
D	VII.F3.AP-113							

F4. DIESEL GENERATOR BUILDING VENTILATION SYSTEM

Systems, Structures, and Components

This section discusses the diesel generator building ventilation system (with warm moist air as the normal environment), which contains ducts, piping and fittings, equipment frames and housings, flexible collars and seals, and heating and cooling air handlers. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the diesel generator building ventilation system are governed by Group C Quality Standards.

With respect to filters and seals, these items are to be addressed consistent with the U.S. Nuclear Regulatory Commission (NRC) position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of the Nuclear Energy Institute (NEI), dated March 10, 2000. Specifically, components that function as system seals are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review (AMR) under 10 CFR 54.21(a)(1)(ii). As part of the methodology description, the application should identify the standards that are relied on for replacement, for example, National Fire Protection Association (NFPA) standards for fire protection equipment.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The system that interfaces with the diesel generator building system is the auxiliary and radwaste area ventilation system (VII.F2). The cooling coils receive their cooling water from other systems, such as the hot water heating system or the chilled water cooling system.

VII AUXILIARY SYSTEMS
Table F4 Diesel Generator Building Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.F4.A-10	3.3-1, 78	Ducting and components (External surfaces)	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
	VII.F4.A-08	3.3-1, 90	Ducting and components (Internal surfaces)	Steel	Condensation (Internal)	Loss of material due to general, pitting, crevice corrosion, (for drip pans and drain lines) MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F4.A-105	3.3-1, 78	Ducting; closure bolting	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.F4.A-565	3.3-1, 161	Heat exchanger components	Copper alloy	Condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VII.F4.AP-41	3.3-1, 80	Heat exchanger components	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical	No

VII AUXILIARY SYSTEMS
Table F4 Diesel Generator Building Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components"	
M	VII.F4.AP-189	3.3-1, 46	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VII.F4.A-418	3.3-1, 96.4	Heat exchanger components (for components not covered by NRC GL 89-13)	Stainless steel, aluminum	Condensation	Loss of material due to pitting, crevice corrosion; fouling that leads to corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.F4.A-417	3.3-1, 96.4	Heat exchanger components (for components not covered by NRC GL 89-13)	Steel, copper alloy	Condensation	Loss of material due to general, pitting, crevice corrosion; fouling that leads to corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.F4.A-733	3.3-1, 204	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air (external), condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII AUXILIARY SYSTEMS
Table F4 Diesel Generator Building Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.F4.AP-204	3.3-1, 50	Heat exchanger tubes	Steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VII.F4.A-419	3.3-1, 96.2	Heat exchanger tubes (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy, aluminum	Condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F4.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.F4.A-750	3.3-1, 221	Piping, piping components	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.F4.AP-142	3.3-1, 92	Piping, piping components	Aluminum	Condensation (internal)	Loss of material due to pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and	No

VII AUXILIARY SYSTEMS
Table F4 Diesel Generator Building Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Ducting Components"	
M	VII.F4.AP-199	3.3-1, 46	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.F4.AP-43	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.F4.AP-31	3.3-1, 72	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.F4.AP-209	3.3-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.F4.AP-221	3.3-1, 6	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
N	VII.F4.A-748	3.3-1, 219	Piping, piping components	Stainless steel	Steam	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

VII AUXILIARY SYSTEMS
Table F4 Diesel Generator Building Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.F4.A-567	3.3-1, 170	Piping, piping components	Stainless steel	Steam	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.F4.AP-127	3.3-1, 97	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
N	VII.F4.A-566	3.3-1, 169	Piping, piping components	Steel, copper alloy	Steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VII.F4.A-495	3.3-1, 159	Piping, piping components, ducting and components	Fiberglass	Air – indoor (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.F4.A-722	3.3-1, 157	Piping, piping components, heat exchanger components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting	No

VII AUXILIARY SYSTEMS
Table F4 Diesel Generator Building Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components"	
M	VII.F4.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.F4.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.F4.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes

VII AUXILIARY SYSTEMS
Table F4 Diesel Generator Building Ventilation System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.F4.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	VII.F4.AP-202	3.3-1, 45	Piping, piping components; tanks	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.F4.AP-103	3.3-1, 96	Seals, piping, piping components	Elastomer	Air – indoor uncontrolled (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.F4.AP-102	3.3-1, 76	Seals, piping, piping components	Elastomer	Air – indoor uncontrolled (internal/external), air-indoor controlled, outdoor air, dry air, air with borated water leakage	Hardening and loss of strength due to elastomer degradation	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.F4.A-504	3.3-1, 156	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII Table F4	AUXILIARY SYSTEMS Diesel Generator Building Ventilation System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VII.F4.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.F4.A-714	3.3-1, 146	Underground piping, piping components; tanks	Stainless steel	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	VII.F4.A-405							
D	VII.F4.AP-109							
D	VII.F4.AP-113							

G. FIRE PROTECTION

Systems, Structures, and Components

This section discusses the fire protection systems for both boiling water reactors (BWRs) and pressurized water reactors (PWRs), which consist of several Class 1 structures, mechanical systems, and electrical components. The Class 1 structures include the intake structure, the turbine building, the reactor building, the auxiliary building, the diesel generator building, and the primary containment. Structural assemblies and components include (i) fire barrier walls, (ii) ceilings, (iii) floors, (iv) fire doors, (v) fire barrier penetration seals, (vi) fire dampers, and (vii) fire resistant material (structural steel coating and insulation). Mechanical systems include the high pressure (HP) service water system, water-based fire suppression systems and gaseous and foam extinguishing systems, the reactor coolant pump (RCP) oil collection system, and the diesel engine for the diesel fire pump. Mechanical components include (i) buried underground, and aboveground piping and piping components, (ii) filters, (iii) fire hydrants, (iv) mulsifiers, (v) fire pumps, (vi) sprinklers/spray nozzles, (vii) strainers, (viii) valves (including containment isolation valves), (ix) standpipe, and hose stations, (x) tanks, (xi) drains, and (xi) electric raceway fire barriers, i.e., fire wraps (electric raceway fire barriers are non-structural fire-rated assemblies that protect the electrical components and cables they enclose).

The fire protection licensing and design basis under subsequent license renewal should not reduce requirements in existing approved fire protection programs. However, the Fire Protection and Fire Water System programs could include additional tests and inspections during the subsequent period of extended operation beyond that in approved fire protection programs. The scope of SSCs included in the Fire Protection and Fire Water System programs should consider interfaces between rooms containing safety related and nonsafety related SSCs. For example, a nonsafety related damper may have a function to close to prevent fire propagation into a room containing safety related SSCs.

With respect to filters, seals, portable fire extinguishers, and fire hoses, these items are to be addressed consistent with the NRC position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of the Nuclear Energy Institute (NEI), dated March 10, 2000. Specifically, components that function as system filters, seals, portable fire extinguishers, and fire hoses are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an AMR under 10 CFR 54.21(a)(1)(ii). As part of the methodology description, the application should identify the standards that are relied on for replacement, for example, National Fire Protection Association (NFPA) codes and standards for fire protection equipment.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an AMR. Pump and valve casings are passive and long-lived, and therefore would be subject to an AMR.

The AMPs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping and tubing.

System Interfaces

The systems and structures that interface with the fire protection system include various Class 1 structures and component (SC) supports (III.A and III.B), the electrical components (VI.A and VI.B), the closed-cycle cooling water (CCCW) system (VII.C2), and the diesel fuel oil system (VII.H1).

VII Table G	AUXILIARY SYSTEMS Fire Protection							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VII.G.A-651	3.3-1, 193	Any	Steel	Treated water, raw water, waste water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
N	VII.G.A-426	3.3-1, 145	Bolting	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
	VII.G.A-19	3.3-1, 57	Fire barrier penetration seals	Elastomer	Air – indoor uncontrolled	Increased hardness; shrinkage; loss of strength due to weathering	AMP XI.M26, "Fire Protection"	No
	VII.G.A-20	3.3-1, 57	Fire barrier penetration seals	Elastomer	Air – outdoor	Increased hardness; shrinkage; loss of strength due to weathering	AMP XI.M26, "Fire Protection"	No
	VII.G.AP-149	3.3-1, 63	Fire hydrants	Steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.M27, "Fire Water System"	No
	VII.G.A-21	3.3-1, 59	Fire rated doors	Steel	Air – indoor uncontrolled	Loss of material due to wear	AMP XI.M26, "Fire Protection"	No
	VII.G.A-22	3.3-1, 59	Fire rated doors	Steel	Air – outdoor	Loss of material due to wear	AMP XI.M26, "Fire Protection"	No

VII Table G	AUXILIARY SYSTEMS Fire Protection							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.G.A-744	3.3-1, 215	Fire water storage tanks	Aluminum	Air – indoor uncontrolled, air – outdoor, condensation, moist air, raw water, treated water, soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M27, "Fire Water System"	No
N	VII.G.A-623	3.3-1, 185	Fire water storage tanks	Aluminum	Air – outdoor, raw water, condensation, soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M27, "Fire Water System"	Yes
N	VII.G.A-747	3.3-1, 218	Fire water storage tanks	Stainless steel	Air – indoor uncontrolled, condensation, moist air, raw water, treated water, soil, concrete	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M27, "Fire Water System"	No
N	VII.G.A-745	3.3-1, 216	Fire water storage tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M27, "Fire Water System"	Yes
N	VII.G.A-746	3.3-1, 217	Fire water storage tanks	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M27, "Fire Water System"	Yes
M	VII.G.A-412	3.3-1, 136	Fire water storage tanks	Steel	Air – indoor uncontrolled, air – outdoor, condensation, moist air, raw water, treated	Loss of material due to general, pitting, crevice corrosion, MIC (raw water, treated water, soil only),	AMP XI.M27, "Fire Water System"	No

VII Table G — AUXILIARY SYSTEMS — Fire Protection

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
					water, soil, concrete	fouling that leads to corrosion		
N	VII.G.A-649	3.3-1, 197	Fire water system piping, piping components, heat exchanger, heat exchanger components with only a leakage boundary (spatial) or structural integrity (attached) intended function	Any	Any external environment	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion, MIC	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.G.A-650	3.3-1, 198	Fire water system piping, piping components, heat exchanger, heat exchanger components with only a leakage	Any	Any internal environment	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion, MIC, fouling that leads to corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII Table G — **AUXILIARY SYSTEMS Fire Protection**

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			boundary (spatial) or structural integrity (attached) intended function					
M	VII.G.AP-150	3.3-1, 58	Halon/carbon dioxide fire suppression system piping, piping components	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M26, "Fire Protection"	No
N	VII.G.A-565	3.3-1, 161	Heat exchanger components	Copper alloy	Condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VII.G.AP-41	3.3-1, 80	Heat exchanger components	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
	VII.G.AP-40	3.3-1, 80	Heat exchanger components	Steel	Air – outdoor (External)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No

VII Table G	AUXILIARY SYSTEMS Fire Protection							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VII.G.AP-187	3.3-1, 42	Heat exchanger tubes	Stainless steel, copper alloy, titanium	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
N	VII.G.A-654	3.3-1, 187	Insulated tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Air – outdoor, air – indoor controlled, air – indoor uncontrolled, condensation	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
M	VII.G.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.G.A-750	3.3-1, 221	Piping, piping components	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.G.AP-180	3.3-1, 65	Piping, piping components	Aluminum	Raw water	Loss of material due to pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M27, "Fire Water System"	No

VII Table G — AUXILIARY SYSTEMS — Fire Protection

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.G.AP-143	3.3-1, 89	Piping, piping components	Copper alloy, steel	Moist air, condensation (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M27, "Fire Water System"	No
M	VII.G.AP-132	3.3-1, 69	Piping, piping components	Copper alloy	Fuel oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.G.AP-197	3.3-1, 64	Piping, piping components	Copper alloy	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC, fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M27, "Fire Water System"	No
M	VII.G.A-47	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.G.A-743	3.3-1, 214	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.G.AP-133	3.3-1, 99	Piping, piping components	Copper alloy, aluminum	Lubricating oil	Loss of material due to general (copper alloy only), pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No

VII Table G	AUXILIARY SYSTEMS Fire Protection							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VII.G.A-462	3.3-1, 177	Piping, piping components	Fiberglass	Soil	Loss of material due to wear	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
N	VII.G.A-456	3.3-1, 165	Piping, piping components	Gray cast iron	Air – indoor uncontrolled, air – outdoor, moist air, condensation, raw water, treated water, waste water (internal)	Loss of material due to general, pitting, crevice corrosion, MIC (raw water, waste water, and treated water environments only)	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.G.A-51	3.3-1, 72	Piping, piping components	Gray cast iron	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.G.A-02	3.3-1, 72	Piping, piping components	Gray cast iron	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.G.AP-31	3.3-1, 72	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.G.A-458	3.3-1, 172	Piping, piping components	PVC	Sunlight	Reduction in impact strength due to photolysis	Plant-specific aging management program	Yes
M	VII.G.AP-209	3.3-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of	Yes

VII Table G	**AUXILIARY SYSTEMS Fire Protection**							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
							Mechanical Components"	
M	VII.G.AP-221	3.3-1, 6	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.G.AP-138	3.3-1, 100	Piping, piping components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.G.A-55	3.3-1, 66	Piping, piping components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M27, "Fire Water System"	No
M	VII.G.AP-136	3.3-1, 71	Piping, piping components	Stainless steel, aluminum	Fuel oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VII.G.A-425	3.3-1, 144	Piping, piping components	Stainless steel, aluminum	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and	No

VII Table G — AUXILIARY SYSTEMS Fire Protection

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Tanks"	
M	VII.G.AP-137	3.3-1, 107	Piping, piping components	Stainless steel, nickel alloy	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.G.AP-234	3.3-1, 68	Piping, piping components	Steel	Fuel oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.G.AP-127	3.3-1, 97	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.G.A-33	3.3-1, 64	Piping, piping components	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC, fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M27, "Fire Water System"	No
M	VII.G.AP-198	3.3-1, 106	Piping, piping components	Steel (with coating or wrapping)	Soil, concrete	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M41, "Buried and Underground Piping and	No

VII Table G — AUXILIARY SYSTEMS — Fire Protection

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Tanks"	
N	VII.G.A-637	3.3-1, 162	Piping, piping components	Steel, stainless steel, copper alloy	Air – outdoor	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M27, "Fire Water System"	No
M	VII.G.A-404	3.3-1, 131	Piping, piping components	Steel, stainless steel, copper alloy, aluminum	Air – indoor uncontrolled (internal), air – outdoor (internal), condensation (internal)	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion, fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M27, "Fire Water System"	No
N	VII.G.A-647	3.3-1, 195	Piping, piping components	Concrete, cementitious material	Raw water	Changes in material properties due to aggressive chemical attack	AMP XI.M27, "Fire Water System"	No
N	VII.G.A-648	3.3-1, 196	Piping, piping components	HDPE	Raw water	Cracking, blistering, change in color due to water absorption	AMP XI.M27, "Fire Water System"	No
N	VII.G.A-495	3.3-1, 159	Piping, piping components, ducting and components	Fiberglass	Air – indoor (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII Table G	AUXILIARY SYSTEMS Fire Protection							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VII.G.A-722	3.3-1, 157	Piping, piping components, heat exchanger components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.G.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.G.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.G.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and	Yes

VII Table G — AUXILIARY SYSTEMS — Fire Protection

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Ducting Components"	
N	VII.G.A-644	3.3-1, 175	Piping, piping components; tanks	Fiberglass	Raw water	Cracking, blistering, change in color due to water absorption	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.G.A-645	3.3-1, 176	Piping, piping components; tanks	Fiberglass	Raw water	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.G.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	VII.G.A-537	3.3-1, 194	Piping, piping components; tanks	PVC	Soil, concrete	Loss of material due to wear	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.G.AP-117	3.3-1, 97	Reactor coolant pump oil collection system: piping,	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32,	No

VII Table G	AUXILIARY SYSTEMS Fire Protection							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
			tubing, valve bodies				"One-Time Inspection"	
M	VII.G.AP-116	3.3-1, 97	Reactor coolant pump oil collection system: tanks	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
N	VII.G.A-504	3.3-1, 156	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.G.AP-75	3.3-1, 32.5	Seals, piping, piping components	Elastomer	Raw water	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.G.AP-76	3.3-1, 32.5	Seals, piping, piping components	Elastomer	Raw water	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting	No

VII Table G	AUXILIARY SYSTEMS Fire Protection							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
							Components"	
N	VII.G.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.G.A-641	3.3-1, 173	Seals, piping, piping components	Elastomer	Raw water	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.G.A-403	3.3-1, 130	Sprinklers	Metallic	Air – indoor controlled, air – indoor uncontrolled, air – outdoor, moist air, condensation, raw water, treated water	Loss of material due to general, pitting, crevice corrosion, MIC (raw water and treated water environments only and all metals except for aluminum only), fouling that leads to corrosion; flow blockage due to	AMP XI.M27, "Fire Water System"	No

VII Table G — AUXILIARY SYSTEMS — Fire Protection

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						fouling		
N	VII.G.A-626	3.3-1, 179	Structural fire barrier walls	Masonry walls	Air – indoor uncontrolled, air – outdoor	Cracking due to restraint shrinkage, creep, aggressive environment	AMP XI.M26, "Fire Protection," and AMP XI.S5, "Masonry Walls"	No
N	VII.G.A-627	3.3-1, 180	Structural fire barrier walls	Masonry walls	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.M26, "Fire Protection," and AMP XI.S5, "Masonry Walls"	No
	VII.G.A-90	3.3-1, 60	Structural fire barriers: walls, ceilings and floors	Reinforced concrete	Air – indoor uncontrolled	Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates	AMP XI.M26, "Fire Protection," and AMP XI.S6, "Structures Monitoring"	No
	VII.G.A-91	3.3-1, 62	Structural fire barriers: walls, ceilings and floors	Reinforced concrete	Air – indoor uncontrolled	Loss of material due to corrosion of embedded steel	AMP XI.M26, "Fire Protection," and AMP XI.S6, "Structures Monitoring"	No
	VII.G.A-92	3.3-1, 61	Structural fire barriers: walls, ceilings and floors	Reinforced concrete	Air – outdoor	Cracking, loss of material due to freeze-thaw, aggressive chemical attack, reaction with aggregates	AMP XI.M26, "Fire Protection," and AMP XI.S6, "Structures Monitoring"	No

VII Table G	**AUXILIARY SYSTEMS Fire Protection**							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	VII.G.A-93	3.3-1, 62	Structural fire barriers: walls, ceilings and floors	Reinforced concrete	Air – outdoor	Loss of material due to corrosion of embedded steel	AMP XI.M26, "Fire Protection," and AMP XI.S6, "Structures Monitoring"	No
N	VII.G.A-714	3.3-1, 146	Underground piping, piping components; tanks	Stainless steel	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	VII.G.A-402							
D	VII.G.A-405							
D	VII.G.A-95							
D	VII.G.A-23							

H1. DIESEL FUEL OIL SYSTEM

Systems, Structures, and Components

This section discusses the diesel fuel oil system, which consists of aboveground and underground piping, valves, pumps, and tanks. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the diesel fuel oil system are governed by Group C Quality Standards.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the diesel fuel oil system are the fire protection (VII.G) and emergency diesel generator (EDG) systems (VII.H2).

VII AUXILIARY SYSTEMS
Table H1 Diesel Fuel Oil System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.H1.A-426	3.3-1, 145	Bolting	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
N	VII.H1.A-565	3.3-1, 161	Heat exchanger components	Copper alloy	Condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.H1.A-654	3.3-1, 187	Insulated tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Air – outdoor, air – indoor controlled, air – indoor uncontrolled, condensation	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
M	VII.H1.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.H1.A-750	3.3-1, 221	Piping, piping components	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical	Yes

VII Table H1	AUXILIARY SYSTEMS Diesel Fuel Oil System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
							Components"	
M	VII.H1.AP-129	3.3-1, 71	Piping, piping components	Aluminum	Fuel oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.H1.AP-199	3.3-1, 46	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.H1.AP-132	3.3-1, 69	Piping, piping components	Copper alloy	Fuel oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.H1.AP-43	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.H1.A-743	3.3-1, 214	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.H1.A-456	3.3-1, 165	Piping, piping components	Gray cast iron	Air – indoor uncontrolled, air – outdoor, moist air, condensation, raw water,	Loss of material due to general, pitting, crevice corrosion, MIC (raw water, waste water, and treated	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and	No

VII Table H1 AUXILIARY SYSTEMS Diesel Fuel Oil System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
					treated water, waste water (internal)	water environments only)	Ducting Components"	
M	VII.H1.A-02	3.3-1, 72	Piping, piping components	Gray cast iron	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.H1.AP-209	3.3-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.H1.AP-221	3.3-1, 6	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.H1.AP-136	3.3-1, 71	Piping, piping components	Stainless steel	Fuel oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VII.H1.A-425	3.3-1, 144	Piping, piping components	Stainless steel, aluminum	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No

VII AUXILIARY SYSTEMS
Table H1 Diesel Fuel Oil System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.H1.AP-137	3.3-1, 107	Piping, piping components	Stainless steel, nickel alloy	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.H1.A-24	3.3-1, 80	Piping, piping components	Steel	Air – outdoor (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.H1.AP-198	3.3-1, 106	Piping, piping components	Steel (with coating or wrapping)	Soil, concrete	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
N	VII.H1.A-495	3.3-1, 159	Piping, piping components, ducting and components	Fiberglass	Air – indoor (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.H1.A-722	3.3-1, 157	Piping, piping components, heat exchanger components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII AUXILIARY SYSTEMS
Table H1 Diesel Fuel Oil System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.H1.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.H1.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.H1.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VII.H1.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes

VII AUXILIARY SYSTEMS
Table H1 Diesel Fuel Oil System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.H1.AP-105	3.3-1, 70	Piping, piping components; tanks	Steel	Fuel oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VII.H1.A-660	3.3-1, 156	Seals, piping, piping components	Elastomer	Fuel oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.H1.A-667	3.3-1, 173	Seals, piping, piping components	Elastomer	Fuel oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.H1.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII Table H1	AUXILIARY SYSTEMS Diesel Fuel Oil System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	VII.H1.A-95	3.3-1, 67	Tanks	Steel	Air – outdoor (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	No
M	VII.H1.A-402	3.3-1, 129	Tanks	Steel	Soil, concrete; air – indoor uncontrolled, raw water, treated water, waste water, condensation	Loss of material due to general, pitting, crevice corrosion, MIC (soil, raw water, treated water, waste water environments only)	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	VII.H1.A-482	3.3-1, 186	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Air – outdoor, air – indoor controlled, air – indoor uncontrolled, raw water, waste water, condensation, soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VII.H1.A-756	3.3-1, 227	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Air (external)	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes
N	VII.H1.A-755	3.3-1, 226	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	No

VII Table H1 AUXILIARY SYSTEMS
Diesel Fuel Oil System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.H1.A-760	3.3-1, 231	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air – outdoor, air – indoor uncontrolled, air – indoor controlled, condensation	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VII.H1.A-757	3.3-1, 228	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air – outdoor, air – indoor uncontrolled, moist air, raw water, condensation	Loss of material due to pitting, crevice corrosion, MIC (raw water environment only)	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VII.H1.A-759	3.3-1, 230	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	VII.H1.A-758	3.3-1, 229	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Soil, ground water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M29, "Aboveground Metallic Tanks"	No
M	VII.H1.A-401	3.3-1, 128	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel	Soil, concrete, air – outdoor, air – indoor uncontrolled, moist air, raw water, condensation	Loss of material due to general, pitting, crevice corrosion, MIC (soil, raw water environments only)	AMP XI.M29, "Aboveground Metallic Tanks"	No

VII Table H1	AUXILIARY SYSTEMS Diesel Fuel Oil System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VII.H1.A-413	3.3-1, 137	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel, stainless steel, aluminum	Treated water, treated borated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	VII.H1.A-714	3.3-1, 146	Underground piping, piping components; tanks	Stainless steel	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	VII.H1.A-405							

H2. EMERGENCY DIESEL GENERATOR SYSTEM

Systems, Structures, and Components

This section discusses the emergency diesel generator (EDG) system, which contains piping, valves, filters, mufflers, strainers, and tanks. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the EDG system are governed by Group C Quality Standards.

With respect to filters and seals, these items are to be addressed consistent with the U.S. Nuclear Regulatory Commission (NRC) position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of the Nuclear Energy Institute (NEI), dated March 10, 2000. Specifically, components that function as system filters are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review (AMR) under 10 CFR 54.21(a)(1)(ii). As part of the methodology description, the application should identify the standards that are relied on for replacement, for example, National Fire Protection Association (NFPA) standards for fire protection equipment.

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the EDG system include the diesel fuel oil system (VII.H1), the closed-cycle cooling water (CCCW) system (VII.C2) and the open-cycle cooling water (OCCW) system (VII.C1) for some plants.

VII Table H2 — AUXILIARY SYSTEMS
Emergency Diesel Generator System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.H2.A-651	3.3-1, 193	Any	Steel	Treated water, raw water, waste water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
N	VII.H2.A-426	3.3-1, 145	Bolting	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.H2.AP-128	3.3-1, 83	Diesel engine exhaust piping, piping components	Stainless steel	Diesel exhaust	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.H2.A-565	3.3-1, 161	Heat exchanger components	Copper alloy	Condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VII.H2.AP-41	3.3-1, 80	Heat exchanger components	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No

VII Table H2	AUXILIARY SYSTEMS Emergency Diesel Generator System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	VII.H2.AP-40	3.3-1, 80	Heat exchanger components	Steel	Air – outdoor (External)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
	VII.H2.AP-131	3.3-1, 98	Heat exchanger components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
N	VII.H2.A-733	3.3-1, 204	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air (external), condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VII.H2.AP-154	3.3-1, 101	Heat exchanger tubes	Aluminum	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
	VII.H2.AP-187	3.3-1, 42	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No

VII AUXILIARY SYSTEMS
Table H2 Emergency Diesel Generator System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.H2.A-415	3.3-1, 140	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.H2.A-750	3.3-1, 221	Piping, piping components	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.H2.AP-255	3.3-1, 48	Piping, piping components	Aluminum	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.H2.AP-129	3.3-1, 71	Piping, piping components	Aluminum	Fuel oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.H2.AP-162	3.3-1, 99	Piping, piping components	Aluminum	Lubricating oil	Loss of material due to pitting, crevice corrosion	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No

VII AUXILIARY SYSTEMS
Table H2 Emergency Diesel Generator System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.H2.AP-199	3.3-1, 46	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.H2.AP-132	3.3-1, 69	Piping, piping components	Copper alloy	Fuel oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VII.H2.AP-133	3.3-1, 99	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.H2.AP-193	3.3-1, 35	Piping, piping components	Copper alloy	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VII.H2.AP-43	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.H2.A-47	3.3-1, 72	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VII.H2.A-743	3.3-1, 214	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No

VII Table H2 — AUXILIARY SYSTEMS — Emergency Diesel Generator System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.H2.A-456	3.3-1, 165	Piping, piping components	Gray cast iron	Air – indoor uncontrolled, air – outdoor, moist air, condensation, raw water, treated water, waste water (internal)	Loss of material due to general, pitting, crevice corrosion, MIC (raw water, waste water, and treated water environments only)	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.H2.A-51	3.3-1, 72	Piping, piping components	Gray cast iron	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.H2.A-02	3.3-1, 72	Piping, piping components	Gray cast iron	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VII.H2.AP-209	3.3-1, 4	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.H2.AP-221	3.3-1, 6	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VII.H2.AP-136	3.3-1, 71	Piping, piping components	Stainless steel	Fuel oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32,	No

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							"One-Time Inspection"	
M	VII.H2.AP-138	3.3-1, 100	Piping, piping components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VII.H2.AP-55	3.3-1, 41	Piping, piping components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
N	VII.H2.A-425	3.3-1, 144	Piping, piping components	Stainless steel, aluminum	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.H2.AP-137	3.3-1, 107	Piping, piping components	Stainless steel, nickel alloy	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.H2.AP-127	3.3-1, 97	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No

VII AUXILIARY SYSTEMS
Table H2 Emergency Diesel Generator System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.H2.A-23	3.3-1, 220	Piping, piping components	Copper alloy, steel	Moist air, condensation (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.H2.AP-194	3.3-1, 37	Piping, piping components	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VII.H2.AP-104	3.3-1, 88	Piping, piping components, diesel engine exhaust	Steel; stainless steel	Diesel exhaust	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.H2.A-495	3.3-1, 159	Piping, piping components, ducting and components	Fiberglass	Air – indoor (internal)	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VII Table H2 — AUXILIARY SYSTEMS — Emergency Diesel Generator System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.H2.A-722	3.3-1, 157	Piping, piping components, heat exchanger components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VII.H2.A-414	3.3-1, 139	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, waste water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VII.H2.A-416	3.3-1, 138	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VII.H2.A-451	3.3-1, 189	Piping, piping components; tanks	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and	Yes

VII AUXILIARY SYSTEMS
Table H2 Emergency Diesel Generator System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Ducting Components"	
M	VII.H2.A-400	3.3-1, 127	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	VII.H2.AP-202	3.3-1, 45	Piping, piping components; tanks	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VII.H2.AP-105	3.3-1, 70	Piping, piping components; tanks	Steel	Fuel oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VII.H2.A-677	3.3-1, 156	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.H2.A-667	3.3-1, 173	Seals, piping, piping components	Elastomer	Fuel oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting	No

VII Table H2 — AUXILIARY SYSTEMS — Emergency Diesel Generator System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components"	
N	VII.H2.A-749	3.3-1, 173	Seals, piping, piping components	Elastomer	Lubricating oil	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VII.H2.A-714	3.3-1, 146	Underground piping, piping components; tanks	Stainless steel	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
D	VII.H2.A-405							
D	VII.H2.AP-258							

I. EXTERNAL SURFACES OF COMPONENTS AND MISCELLANEOUS BOLTING

Systems, Structures, and Components

This section addresses the aging management programs (AMPs) for the degradation of external surfaces of structures and components (SCs), including closure bolting in the auxiliary systems in pressurized water reactors (PWRs) and boiling water reactors (BWRs). For the steel components in PWRs, this section addresses only boric acid corrosion of external surfaces as a result of dripping borated water that is leaking from an adjacent PWR component. Boric acid corrosion can also occur for steel components containing borated water due to leakage; such components and the related AMP are covered in the appropriate major plant sections in VII.

System Interfaces

The SCs covered in this section belong to the Auxiliary Systems in PWRs and BWRs. (For example, see System Interfaces in VII.A1 to VII.H2 for details.)

VII AUXILIARY SYSTEMS
Table I External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.I.AP-261	3.3-1, 15	Bolting	Copper alloy	Any environment	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	VII.I.A-423	3.3-1, 142	Bolting	Copper alloy	Raw water, waste water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M18, "Bolting Integrity"	No
	VII.I.AP-262	3.3-1, 15	Bolting	Nickel alloy	Any environment	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
M	VII.I.AP-244	3.3-1, 14	Bolting	Stainless Steel	Soil	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	VII.I.A-725	3.3-1, 171	Bolting	Stainless steel	Treated borated water	Loss of material due to pitting, crevice corrosion	AMP XI.M18, "Bolting Integrity"	No
	VII.I.AP-265	3.3-1, 15	Bolting	Stainless steel	Treated borated water	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
M	VII.I.AP-243	3.3-1, 108	Bolting	Stainless Steel, nickel alloy	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No

VII AUXILIARY SYSTEMS
Table I External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.I.A-102	3.3-1, 9	Bolting	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
N	VII.I.A-424	3.3-1, 143	Bolting	Steel	Fuel Oil, Lubricating Oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M18, "Bolting Integrity"	No
M	VII.I.AP-242	3.3-1, 14	Bolting	Steel	Soil	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
M	VII.I.AP-241	3.3-1, 109	Bolting	Steel	Soil, concrete	Loss of material due to general, pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
	VII.I.AP-126	3.3-1, 12	Bolting	Steel; stainless steel	Air – outdoor (External)	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M18, "Bolting Integrity"	No
	VII.I.AP-263	3.3-1, 15	Bolting	Steel; stainless steel	Air – outdoor (External)	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	VII.I.A-421	3.3-1, 141	Bolting	Steel; stainless steel	Condensation	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No

VII AUXILIARY SYSTEMS
Table I External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.I.AP-266	3.3-1, 15	Bolting	Steel; stainless steel	Fuel oil	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	VII.I.A-422	3.3-1, 141	Bolting	Steel; stainless steel	Fuel Oil, Lubricating Oil	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	VII.I.A-723	3.3-1, 171	Bolting	Steel; stainless steel	Raw water, waste water	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M18, "Bolting Integrity"	No
M	VII.I.AP-264	3.3-1, 15	Bolting	Steel; stainless steel	Raw water, waste water	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	VII.I.A-726	3.3-1, 171	Bolting	Steel; stainless steel	Treated water	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M18, "Bolting Integrity"	No
	VII.I.AP-267	3.3-1, 15	Bolting	Steel; stainless steel	Treated water	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
	VII.I.A-03	3.3-1, 13	Closure bolting	Steel	Air with steam or water leakage	Loss of material due to general corrosion	AMP XI.M18, "Bolting Integrity"	No

VII AUXILIARY SYSTEMS

Table I External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.I.A-04	3.3-1, 10	Closure bolting	Steel, high-strength	Air with steam or water leakage	Cracking due to stress corrosion cracking; cyclic loading	AMP XI.M18, "Bolting Integrity"	No
	VII.I.AP-125	3.3-1, 12	Closure bolting	Steel; stainless steel	Air – indoor uncontrolled (external)	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M18, "Bolting Integrity"	No
	VII.I.AP-124	3.3-1, 15	Closure bolting	Steel; stainless steel	Air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
M	VII.I.A-105	3.3-1, 78	Ducting; closure bolting	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.I.A-77	3.3-1, 78	External surfaces	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.I.A-78	3.3-1, 78	External surfaces	Steel	Air – outdoor (External)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No

VII Table I	AUXILIARY SYSTEMS External Surfaces of Components and Miscellaneous Bolting							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	VII.I.A-79	3.3-1, 9	External surfaces	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
M	VII.I.A-81	3.3-1, 78	External surfaces	Steel	Condensation (External)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.I.A-716	3.3-1, 151	Heat exchanger components	Stainless steel, steel, aluminum, copper alloy, titanium	Air, condensation (external)	Reduction of heat transfer due to fouling	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.I.A-762	3.3-1, 233	Insulated piping, piping components, tanks	Aluminum	Condensation, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
N	VII.I.A-734	3.3-1, 205	Insulated piping, piping components, tanks	Stainless steel	Air – indoor uncontrolled, air – indoor controlled, condensation, air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
N	VII.I.A-761	3.3-1, 232	Insulated piping, piping components, tanks	Stainless steel	Condensation, air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes

VII AUXILIARY SYSTEMS
Table I External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.I.A-405	3.3-1, 132	Insulated piping, piping components, tanks	Steel, copper alloy, copper alloy (> 15% Zn), aluminum	Condensation, air – outdoor	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion; cracking due to stress corrosion cracking (copper alloy (>15% Zn) only)	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.I.A-704	3.3-1, 182	Jacketed thermal insulation	Any	Air – indoor uncontrolled, air – outdoor environment, air with borated water leakage, air with reactor coolant leakage, air with steam or water leakage	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.I.A-428	3.3-1, 149	Piping and ducting, piping and ducting components	Fiberglass	Air – outdoor	Cracking, blistering, change in color due to water absorption	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.I.A-720	3.3-1, 150	Piping and piping components; ducting and ducting components	Fiberglass	Air – indoor	Change in material properties due to exposure to ultraviolet light, ozone, radiation, temperature	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No

VII AUXILIARY SYSTEMS
Table I External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VII.I.A-427	3.3-1, 148	Piping, ducting components	Elastomer	Air – outdoor	Hardening and loss of strength due to elastomer degradation	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.I.AP-256	3.3-1, 81	Piping, piping components	Aluminum	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.I.A-753	3.3-1, 224	Piping, piping components	Aluminum	Air – outdoor (external)	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
N	VII.I.A-702	3.3-1, 181	Piping, piping components	Aluminum	Condensation (external)	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VII.I.AP-159	3.3-1, 81	Piping, piping components	Copper alloy	Air – outdoor (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.I.AP-109	3.3-1, 79	Piping, piping components	Copper alloy	Condensation (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of	No

VII AUXILIARY SYSTEMS
Table I External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Mechanical Components"	
M	VII.I.AP-66	3.3-1, 9	Piping, piping components	Copper alloy (>15% Zn)	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
N	VII.I.A-455	3.3-1, 164	Piping, piping components	Gray cast iron	Air – indoor uncontrolled, air – outdoor, moist air, condensation, raw water, treated water, waste water (external)	Loss of material due to general, pitting, crevice corrosion, MIC (raw water, waste water, and treated water environments only)	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.I.A-701	3.3-1, 181	Piping, piping components	Nickel alloy	Condensation (external)	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.I.A-700	3.3-1, 181	Piping, piping components	Stainless steel	Condensation (external)	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.I.A-703	3.3-1, 181	Piping, piping components	Titanium	Condensation (external)	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical	No

VII AUXILIARY SYSTEMS
Table I External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components"	
N	VII.I.A-719	3.3-1, 154	Piping, piping components, ducting, ducting components	Elastomer, fiberglass	Air – outdoor, air – indoor	Loss of material due to wear	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.I.A-707	3.3-1, 191	Piping, piping components, tanks	Aluminum	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
N	VII.I.A-452	3.3-1, 190	Piping, piping components, tanks	Aluminum	Raw water, waste water, condensation (external)	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
N	VII.I.A-708	3.3-1, 153	Seals, piping, piping components	Elastomer	Air – outdoor	Hardening and loss of strength due to elastomer degradation	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VII.I.AP-113	3.3-1, 82	Seals, piping, piping components	Elastomer	Air – indoor uncontrolled (external), air-indoor controlled, outdoor air, dry air, air	Loss of material due to wear	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No

VII AUXILIARY SYSTEMS
Table I External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
					with borated water leakage			
N	VII.I.A-754	3.3-1, 225	Tanks	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VII.I.A-751	3.3-1, 222	Tanks	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VII.I.A-752	3.3-1, 223	Underground piping, piping components	Aluminum	Air (external)	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes
M	VII.I.A-406	3.3-1, 133	Underground piping, piping components	HDPE	Air – indoor uncontrolled, condensation, air – outdoor (external)	Cracking, blistering, change in color due to water absorption	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VII.I.AP-284	3.3-1, 109a	Underground piping, piping components	Steel, stainless steel, nickel alloy, copper alloy	Air – indoor uncontrolled, condensation, air-outdoor (external)	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M41, "Buried and Underground piping and Tanks"	No
N	VII.I.A-706	3.3-1, 192	Underground piping, piping components, tanks	Aluminum	Air – outdoor, raw water, condensation	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes

J. COMMON MISCELLANEOUS MATERIAL/ENVIRONMENT COMBINATIONS

Systems, Structures, and Components

This section addresses the aging management programs (AMPs) for miscellaneous material/environment combinations which may be found throughout structures and components (SCs) for auxiliary systems. For the material/environment combinations in this part, aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation. With the exception of components within the scope of American Society of Mechanical Engineers (ASME) Section XI, no AMPs for these SCs are required.

System Interfaces

The SCs covered in this section belong to the auxiliary systems in pressurized water reactor (PWRs) and boiling water reactors (BWRs). (For example, see System Interfaces in VII.A to VII.I for details.)

VII AUXILIARY SYSTEMS
Table J Common Miscellaneous Material/Environment Combinations

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.J.AP-151	3.3-1, 122	Heat exchanger components	Titanium	Air – indoor uncontrolled, air – outdoor	None	None	No
N	VII.J.A-712	3.3-1, 167	Piping components	Zinc	Air – indoor	None	None	No
	VII.J.AP-48	3.3-1, 117	Piping elements	Glass	Air	None	None	No
	VII.J.AP-14	3.3-1, 117	Piping elements	Glass	Air – indoor uncontrolled (external)	None	None	No
	VII.J.AP-167	3.3-1, 117	Piping elements	Glass	Air – outdoor	None	None	No
	VII.J.AP-96	3.3-1, 117	Piping elements	Glass	Air with borated water leakage	None	None	No
	VII.J.AP-166	3.3-1, 117	Piping elements	Glass	Closed-cycle cooling water	None	None	No
	VII.J.AP-97	3.3-1, 117	Piping elements	Glass	Condensation (Internal/External)	None	None	No
	VII.J.AP-49	3.3-1, 117	Piping elements	Glass	Fuel oil	None	None	No

VII AUXILIARY SYSTEMS
Table J Common Miscellaneous Material/Environment Combinations

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VII.J.AP-98	3.3-1, 117	Piping elements	Glass	Gas	None	None	No
	VII.J.AP-15	3.3-1, 117	Piping elements	Glass	Lubricating oil	None	None	No
	VII.J.AP-50	3.3-1, 117	Piping elements	Glass	Raw water	None	None	No
	VII.J.AP-52	3.3-1, 117	Piping elements	Glass	Treated borated water	None	None	No
	VII.J.AP-51	3.3-1, 117	Piping elements	Glass	Treated water	None	None	No
M	VII.J.AP-277	3.3-1, 119	Piping elements	Glass	Waste Water	None	None	No
N	VII.J.A-763	3.3-1, 234	Piping, piping components	Aluminum	Air – dry, air – indoor uncontrolled, air – indoor controlled	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes
M	VII.J.AP-37	3.3-1, 113	Piping, piping components	Aluminum	Gas	None	None	No
M	VII.J.AP-8	3.3-1, 114	Piping, piping components	Copper alloy	Air – dry	None	None	No

VII AUXILIARY SYSTEMS
Table J Common Miscellaneous Material/Environment Combinations

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.J.AP-144	3.3-1, 114	Piping, piping components	Copper alloy	Air – indoor uncontrolled (internal/external)	None	None	No
M	VII.J.AP-11	3.3-1, 115	Piping, piping components	Copper alloy	Air with borated water leakage	None	None	No
N	VII.J.A-711	3.3-1, 166	Piping, piping components	Copper alloy	Concrete	None	None	No
M	VII.J.AP-9	3.3-1, 114	Piping, piping components	Copper alloy	Gas	None	None	No
N	VII.J.A-735	3.3-1, 206	Piping, piping components	Copper alloy (≤8% Al)	Air with borated water leakage	None	None	No
N	VII.J.A-710	3.3-1, 178	Piping, piping components	Fiberglass	Concrete	None	None	No
M	VII.J.AP-13	3.3-1, 116	Piping, piping components	Galvanized steel	Air – indoor uncontrolled	None	None	No
M	VII.J.AP-16	3.3-1, 118	Piping, piping components	Nickel alloy	Air – indoor uncontrolled (external)	None	None	No
M	VII.J.AP-260	3.3-1, 119	Piping, piping components	Nickel alloy	Air with borated water leakage	None	None	No

VII — AUXILIARY SYSTEMS

Table J — Common Miscellaneous Material/Environment Combinations

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.J.AP-268	3.3-1, 119	Piping, piping components	PVC	Air – indoor uncontrolled	None	None	No
M	VII.J.AP-269	3.3-1, 119	Piping, piping components	PVC	Condensation (internal), potable water, raw water, waste water	None	None	No
M	VII.J.AP-20	3.3-1, 120	Piping, piping components	Stainless steel	Air – dry	None	None	No
M	VII.J.AP-17	3.3-1, 120	Piping, piping components	Stainless steel	Air – indoor uncontrolled (external)	None	None	No
M	VII.J.AP-123	3.3-1, 120	Piping, piping components	Stainless steel	Air – indoor uncontrolled (internal/external)	None	None	No
M	VII.J.AP-18	3.3-1, 120	Piping, piping components	Stainless steel	Air with borated water leakage	None	None	No
M	VII.J.AP-19	3.3-1, 202	Piping, piping components	Stainless steel	Concrete	None	None	Yes
M	VII.J.AP-22	3.3-1, 120	Piping, piping components	Stainless steel	Gas	None	None	No
M	VII.J.AP-4	3.3-1, 121	Piping, piping components	Steel	Air – dry	None	None	No

VII AUXILIARY SYSTEMS
Table J Common Miscellaneous Material/Environment Combinations

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VII.J.AP-2	3.3-1, 121	Piping, piping components	Steel	Air – indoor controlled (external)	None	None	No
M	VII.J.AP-282	3.3-1, 112	Piping, piping components	Steel	Concrete	None	None	Yes
M	VII.J.AP-6	3.3-1, 121	Piping, piping components	Steel	Gas	None	None	No
M	VII.J.AP-160	3.3-1, 122	Piping, piping components	Titanium	Air – indoor uncontrolled, air – outdoor	None	None	No
N	VII.J.A-709	3.3-1, 184	Piping, piping components; tanks	PVC	Concrete	None	None	No
D	VII.J.AP-134							
D	VII.J.AP-135							
D	VII.J.AP-36							

CHAPTER VIII

STEAM AND POWER CONVERSION SYSTEM

VIII STEAM AND POWER CONVERSION SYSTEM

A. STEAM TURBINE SYSTEM

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B2. MAIN STEAM SYSTEM (BOILING WATER REACTOR)

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H. EXTERNAL SURFACES OF COMPONENTS AND MISCELLANEOUS BOLTING

I. COMMON MISCELLANEOUS MATERIAL/ENVIRONMENT COMBINATIONS

A. STEAM TURBINE SYSTEM

Systems, Structures, and Components

This section addresses the piping and fittings in the steam turbine system for both pressurized water reactors (PWRs) and boiling water reactors (BWRs) and consists of the lines from the high-pressure turbine to the moisture separator/reheater (MSR) and the lines from the MSR to the low pressure (LP) turbine. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the steam turbine system are governed by Group D Quality Standards.

The steam turbine performs its intended functions with moving parts. Pursuant to 10 CFR 54.2(a) (1), therefore, it is not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material/environment combinations, where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation, are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the steam turbine system include the PWR and BWR main steam (MS) system (VIII.B1 and VIII.B2), the extraction steam system (VIII.C), and the condensate system (VIII.E).

VIII STEAM POWER CONVERSION SYSTEM
Table A Steam Turbine System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VIII.A.S-432	3.4-1, 81	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
M	VIII.A.S-23	3.4-1, 25	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
	VIII.A.SP-64	3.4-1, 28	Heat exchanger components and tubes	Steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VIII.A.S-415	3.4-1, 68	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.A.SP-92	3.4-1, 43	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.A.SP-31	3.4-1, 20	Piping, piping components	Copper alloy	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No

VIII Table A	**STEAM POWER CONVERSION SYSTEM Steam Turbine System**							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.A.SP-101	3.4-1, 16	Piping, piping components	Copper alloy	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.A.SP-30	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.A.SP-28	3.4-1, 33	Piping, piping components	Gray cast iron	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.A.SP-27	3.4-1, 33	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.A.SP-118	3.4-1, 2	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.A.SP-127	3.4-1, 3	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.A.SP-95	3.4-1, 44	Piping, piping components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32,	No

VIII Table A	STEAM POWER CONVERSION SYSTEM Steam Turbine System							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							"One-Time Inspection"	
M	VIII.A.SP-98	3.4-1, 11	Piping, piping components	Stainless steel	Steam	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.A.SP-155	3.4-1, 84	Piping, piping components	Stainless steel	Steam	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.A.SP-91	3.4-1, 40	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.A.SP-71	3.4-1, 14	Piping, piping components	Steel	Steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.A.S-15	3.4-1, 5	Piping, piping components	Steel	Steam	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No

VIII Table A — STEAM POWER CONVERSION SYSTEM — Steam Turbine System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VIII.A.S-436	3.4-1, 89	Piping, piping components (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy	Raw water	Loss of material due to general (steel and copper alloy only), pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VIII.A.S-401	3.4-1, 66	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.A.S-414	3.4-1, 67	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.A.S-400	3.4-1, 61	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes

VIII Table A	STEAM POWER CONVERSION SYSTEM Steam Turbine System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VIII.A.S-441	3.4-1, 93	Tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
D	VIII.A.S-402							

B1. MAIN STEAM SYSTEM (PRESSURIZED WATER REACTOR)

Systems, Structures, and Components

This section addresses the main steam (MS) system for pressurized water reactors (PWRs). The section includes the MS lines from the steam generator (SG) to the steam turbine and the turbine bypass lines from the MS lines to the condenser. Also included are the lines to the main feedwater (FW) and auxiliary feedwater (AFW) pump turbines, steam drains, and valves, including the containment isolation valves on the MS lines and the lines to the AFW pump turbines.

Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," the portion of the MS system extending from the SG up to the second containment isolation valve is governed by Group B or C Quality Standards, and all other components that comprise the MS system located downstream of these isolation valves are governed by Group D Quality Standards.

The internals of the valves perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of the external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material/environment combinations, where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation, are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems and structures that interface with the MS system include PWR concrete or steel containment structures (II.A1 and II.A2), common components (II.A3), the SG (IV.D1 and IV.D2), the steam turbine system (VIII.A), the FW system (VIII.D1), the condensate system (VIII.E), and the AFW system (VIII.G).

VIII Table B1	**STEAM POWER CONVERSION SYSTEM Main Steam System (PWR)**							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VIII.B1.S-432	3.4-1, 81	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
M	VIII.B1.S-415	3.4-1, 68	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.B1.SP-157	3.4-1, 84	Piping, piping components	Nickel alloy	Steam	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.B1.SP-118	3.4-1, 2	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.B1.SP-127	3.4-1, 3	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes

VIII Table B1 — STEAM POWER CONVERSION SYSTEM — Main Steam System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VIII.B1.SP-110	3.4-1, 39	Piping, piping components	Stainless steel	Condensation (internal)	Loss of material due to pitting and crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VIII.B1.SP-98	3.4-1, 11	Piping, piping components	Stainless steel	Steam	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.B1.SP-155	3.4-1, 84	Piping, piping components	Stainless steel	Steam	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.B1.SP-87	3.4-1, 85	Piping, piping components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VIII.B1.SP-88	3.4-1, 11	Piping, piping components	Stainless steel	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

VIII Table B1 — STEAM POWER CONVERSION SYSTEM — Main Steam System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VIII.B1.SP-59	3.4-1, 36	Piping, piping components	Steel	Air – outdoor (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VIII.B1.SP-60	3.4-1, 37	Piping, piping components	Steel	Condensation (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VIII.B1.SP-71	3.4-1, 14	Piping, piping components	Steel	Steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.B1.S-15	3.4-1, 5	Piping, piping components	Steel	Steam	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	VIII.B1.S-08	3.4-1, 1	Piping, piping components	Steel	Steam, treated water	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes

VIII Table B1 — STEAM POWER CONVERSION SYSTEM — Main Steam System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VIII.B1.SP-74	3.4-1, 13	Piping, piping components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.B1.S-401	3.4-1, 66	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.B1.S-414	3.4-1, 67	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.B1.S-400	3.4-1, 61	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	VIII.B1.S-441	3.4-1, 93	Tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes

VIII Table B1	STEAM POWER CONVERSION SYSTEM Main Steam System (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
D	VIII.B1.S-402							

B2. MAIN STEAM SYSTEM (BOILING WATER REACTOR)

Systems, Structures, and Components

This section addresses the main steam (MS) system for boiling water reactors (BWRs). The section includes the MS lines from the outermost containment isolation valve to the steam turbines and the turbine bypass lines from the MS lines to the condenser. Also included are steam drains, lines to the main feedwater (FW), high-pressure coolant injection (HPCI), and reactor core isolation cooling (RCIC) turbines.

Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” portions of the MS system extending from the outermost containment isolation valve up to and including the turbine stop and bypass valves, as well as connected piping up to and including the first valve that is either normally closed or capable of automatic closure during all modes of normal reactor operation, are governed by Group B Quality Standards. The remaining portions of the MS system consist of components governed by Group D Quality Standards. For BWRs containing a shutoff valve in addition to the two containment isolation valves in the MS line, Group B Quality Standards apply only to those portions of the system extending from the outermost containment isolation valves up to and including the shutoff valve. The portion of the MS system extending from the reactor pressure vessel up to the second isolation valve and including the containment isolation valves is governed by Group A Quality Standards, and is covered in IV.C1.

The internals of the valves perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of the external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material/environment combinations, where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation, are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the MS system include the BWR Mark 1, Mark 2, or Mark 3 containment structures (II.B1, II.B2, and II.B3, respectively) and common components (II.B4), the reactor coolant pressure boundary (RCPB) (IV.C1), the steam turbine system (VIII.A), the FW system (VIII.D2), and the condensate system (VIII.E).

VIII Table B2 — STEAM POWER CONVERSION SYSTEM — Main Steam System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VIII.B2.S-432	3.4-1, 81	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
M	VIII.B2.S-415	3.4-1, 68	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.B2.SP-118	3.4-1, 2	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.B2.SP-127	3.4-1, 3	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.B2.SP-110	3.4-1, 39	Piping, piping components	Stainless steel	Condensation (internal)	Loss of material due to pitting and crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VIII Table B2 — STEAM POWER CONVERSION SYSTEM — Main Steam System (BWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VIII.B2.SP-98	3.4-1, 11	Piping, piping components	Stainless steel	Steam	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.B2.SP-155	3.4-1, 84	Piping, piping components	Stainless steel	Steam	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.B2.SP-160	3.4-1, 14	Piping, piping components	Steel	Steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.B2.S-15	3.4-1, 5	Piping, piping components	Steel	Steam	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	VIII.B2.S-08	3.4-1, 1	Piping, piping components	Steel	Steam, treated water	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	VIII.B2.SP-73	3.4-1, 14	Piping, piping components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

VIII Table B2	STEAM POWER CONVERSION SYSTEM Main Steam System (BWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.B2.S-401	3.4-1, 66	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.B2.S-414	3.4-1, 67	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.B2.S-400	3.4-1, 61	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	VIII.B2.S-441	3.4-1, 93	Tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
D	VIII.B2.S-402							

C. EXTRACTION STEAM SYSTEM

Systems, Structures, and Components

This section addresses the extraction steam lines for both pressurized water reactors (PWRs) and boiling water reactors (BWRs), which extend from the steam turbine to the feedwater (FW) heaters, including the drain lines. Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications, and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components that comprise the extraction steam system are governed by Group D Quality Standards.

The internals of the valves perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of the external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material/environment combinations, where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation, are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the extraction steam system include the steam turbine system (VIII.A), the PWR and BWR FW system (VIII.D1 and VIII.D2), and the condensate system (VIII.E).

VIII Table C	STEAM POWER CONVERSION SYSTEM Extraction Steam System							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VIII.C.S-432	3.4-1, 81	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
M	VIII.C.S-415	3.4-1, 68	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.C.SP-118	3.4-1, 2	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.C.SP-127	3.4-1, 3	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.C.SP-87	3.4-1, 85	Piping, piping components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VIII.C.SP-88	3.4-1, 11	Piping, piping components	Stainless steel	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32,	No

VIII Table C	STEAM POWER CONVERSION SYSTEM Extraction Steam System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
							"One-Time Inspection"	
M	VIII.C.SP-71	3.4-1, 14	Piping, piping components	Steel	Steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.C.S-15	3.4-1, 5	Piping, piping components	Steel	Steam	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	VIII.C.SP-73	3.4-1, 14	Piping, piping components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.C.S-401	3.4-1, 66	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No

VIII Table C	STEAM POWER CONVERSION SYSTEM Extraction Steam System							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VIII.C.S-414	3.4-1, 67	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.C.S-400	3.4-1, 61	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	VIII.C.S-441	3.4-1, 93	Tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
D	VIII.C.S-402							

D1. FEEDWATER SYSTEM (PRESSURIZED WATER REACTOR)

Systems, Structures, and Components

This section addresses the main feedwater (FW) system for pressurized water reactors (PWRs), which extends from the condensate system to the steam generator (SG). It consists of the main FW lines, FW pumps, and valves, including the containment isolation valves. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” the portion of the FW system extending from the secondary side of the SG up to the second containment isolation valve is governed by Group B or C Quality Standards. All other components in the FW system located downstream from these isolation valves are governed by Group D Quality Standards.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of the external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material/environment combinations, where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation, are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems and structures that interface with the FW system include PWR concrete or steel containment structures (II.A1 and II.A2) and common components (II.A3), the SGs (IV.D1 and IV.D2), the main steam (MS) system (VIII.B1), the extraction steam system (VIII.C), the condensate system (VIII.E), and the auxiliary feedwater (AFW) system (VIII.G).

VIII Table D1	**STEAM POWER CONVERSION SYSTEM Feedwater Systems (PWR)**							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VIII.D1.S-432	3.4-1, 81	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
M	VIII.D1.S-415	3.4-1, 68	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VIII.D1.S-458	3.4-1, 110	Piping, piping components	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VIII.D1.SP-90	3.4-1, 16	Piping, piping components	Aluminum	Treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.D1.S-408	3.4-1, 60	Piping, piping components	Any	Treated water	Wall thinning due to erosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No

VIII Table D1	STEAM POWER CONVERSION SYSTEM Feedwater Systems (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.D1.SP-92	3.4-1, 43	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
N	VIII.D1.S-439	3.4-1, 92	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.D1.SP-118	3.4-1, 2	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.D1.SP-127	3.4-1, 3	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.D1.SP-95	3.4-1, 44	Piping, piping components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.D1.SP-87	3.4-1, 85	Piping, piping components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes

VIII Table D1 — STEAM POWER CONVERSION SYSTEM
Feedwater Systems (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VIII.D1.SP-88	3.4-1, 11	Piping, piping components	Stainless steel	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.D1.SP-91	3.4-1, 40	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.D1.S-11	3.4-1, 1	Piping, piping components	Steel	Treated water	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	VIII.D1.SP-74	3.4-1, 13	Piping, piping components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.D1.S-16	3.4-1, 5	Piping, piping components	Steel	Treated water	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	VIII.D1.S-401	3.4-1, 66	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water,	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat	No

VIII Table D1 — STEAM POWER CONVERSION SYSTEM
Feedwater Systems (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
					lubricating oil	damage, spalling for cementitious coatings/linings	Exchangers, and Tanks"	
M	VIII.D1.S-414	3.4-1, 67	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.D1.S-400	3.4-1, 61	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	VIII.D1.S-429	3.4-1, 78	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VIII.D1.S-459	3.4-1, 111	Tanks	Aluminum	Raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes

VIII Table D1	STEAM POWER CONVERSION SYSTEM Feedwater Systems (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VIII.D1.S-441	3.4-1, 93	Tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
D	VIII.D1.S-402							

D2. FEEDWATER SYSTEM (BOILING WATER REACTOR)

Systems, Structures, and Components

This section addresses the main feedwater (FW) system for boiling water reactors (BWRs), which extends from the condensate and condensate booster system to the outermost FW isolation valve on the FW lines to the reactor vessel. It consists of the main FW lines, FW pumps, and valves.

Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” the portions of the FW system extending from the outermost containment isolation valves up to and including the shutoff valve, or the first valve that is either normally closed or capable of closure during all modes of normal reactor operation, are governed by Group B Quality Standards. The remaining portions of the FW system consist of components governed by Group D Quality Standards. The portion of the FW system extending from the reactor vessel up to the second containment isolation valve, including the isolation valves, is governed by Group A Quality Standards and is covered in IV.C1.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of the external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material/environment combinations, where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation, are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the FW system include the BWR Mark 1, Mark 2, or Mark 3 containment structures (II.B1, II.B2, and II.B3, respectively) and common components (II.B4), the reactor coolant pressure boundary (RCPB) (IV.C1), the main steam (MS) system (VIII.B2), the extraction steam system (VIII.C), and the condensate system (VIII.E).

VIII Table D2	STEAM POWER CONVERSION SYSTEM Feedwater Systems (BWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VIII.D2.S-432	3.4-1, 81	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
M	VIII.D2.S-415	3.4-1, 68	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VIII.D2.S-458	3.4-1, 110	Piping, piping components	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VIII.D2.SP-90	3.4-1, 16	Piping, piping components	Aluminum	Treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.D2.S-408	3.4-1, 60	Piping, piping components	Any	Treated water	Wall thinning due to erosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No

VIII Table D2	STEAM POWER CONVERSION SYSTEM Feedwater Systems (BWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.D2.SP-92	3.4-1, 43	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
N	VIII.D2.S-439	3.4-1, 92	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.D2.SP-118	3.4-1, 2	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.D2.SP-127	3.4-1, 3	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.D2.SP-95	3.4-1, 44	Piping, piping components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.D2.SP-87	3.4-1, 85	Piping, piping components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes

VIII Table D2	STEAM POWER CONVERSION SYSTEM Feedwater Systems (BWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.D2.SP-91	3.4-1, 40	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.D2.S-11	3.4-1, 1	Piping, piping components	Steel	Treated water	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	VIII.D2.SP-73	3.4-1, 14	Piping, piping components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.D2.S-16	3.4-1, 5	Piping, piping components	Steel	Treated water	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	VIII.D2.S-401	3.4-1, 66	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No

VIII Table D2	STEAM POWER CONVERSION SYSTEM Feedwater Systems (BWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.D2.S-414	3.4-1, 67	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.D2.S-400	3.4-1, 61	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
N	VIII.D2.S-429	3.4-1, 78	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VIII.D2.S-459	3.4-1, 111	Tanks	Aluminum	Raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
N	VIII.D2.S-441	3.4-1, 93	Tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes

VIII Table D2	STEAM POWER CONVERSION SYSTEM Feedwater Systems (BWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
D	VIII.D2.S-402							

E. CONDENSATE SYSTEM

Systems, Structures, and Components

This section addresses the condensate system for both pressurized water reactors (PWRs) and boiling water reactors (BWRs), which extend from the condenser hotwells to the suction of feedwater (FW) pumps, including condensate and condensate booster pumps, condensate coolers, condensate cleanup system, and condensate storage tanks. Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications, and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” all components that comprise the condensate system are governed by Group D Quality Standards.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of the external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material/environment combinations, where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation, are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the condensate system include the steam turbine system (VIII.A), the PWR and BWR main steam (MS) system (VIII.B1 and VIII.B2), the PWR and BWR FW system (VIII.D1 and VIII.D2), the auxiliary feedwater (AFW) system (VIII.G, PWR only), the BWR reactor water cleanup (RWCU) system (VII.E3), the open or closed cycle cooling water (CCCW) systems (VII.C1 or VII.C2), and the condensate storage facility.

VIII Table E — STEAM POWER CONVERSION SYSTEM — Condensate System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VIII.E.S-432	3.4-1, 81	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
N	VIII.E.S-421	3.4-1, 73	Bolting	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VIII.E.S-25	3.4-1, 26	Heat exchanger components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VIII.E.SP-117	3.4-1, 19	Heat exchanger components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VIII.E.S-23	3.4-1, 25	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VIII.E.SP-146	3.4-1, 19	Heat exchanger components	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No

VIII Table E	STEAM POWER CONVERSION SYSTEM Condensate System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.E.SP-77	3.4-1, 15	Heat exchanger components	Steel	Treated water	Loss of material due to general, pitting, crevice, corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VIII.E.S-437	3.4-1, 90	Heat exchanger components (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy	Raw water	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VIII.E.SP-80	3.4-1, 85	Heat exchanger components and tubes	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
N	VIII.E.S-433	3.4-1, 86	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air (external)	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VIII.E.SP-57	3.4-1, 28	Heat exchanger tubes	Copper alloy	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No

VIII Table E — STEAM POWER CONVERSION SYSTEM — Condensate System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VIII.E.SP-56	3.4-1, 22	Heat exchanger tubes	Copper alloy	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
	VIII.E.SP-100	3.4-1, 18	Heat exchanger tubes	Copper alloy	Treated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
	VIII.E.SP-41	3.4-1, 28	Heat exchanger tubes	Stainless steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
	VIII.E.S-28	3.4-1, 22	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
	VIII.E.SP-96	3.4-1, 18	Heat exchanger tubes	Stainless steel	Treated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
	VIII.E.SP-64	3.4-1, 28	Heat exchanger tubes	Steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VIII.E.S-438	3.4-1, 91	Heat exchanger tubes (for components not covered by	Steel, stainless steel, copper alloy	Raw water	Loss of material due to general (steel and copper alloy only), pitting, crevice corrosion,	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous	No

VIII Table E — STEAM POWER CONVERSION SYSTEM
Condensate System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
			NRC GL 89-13)			MIC	Piping and Ducting Components"	
M	VIII.E.S-415	3.4-1, 68	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VIII.E.S-458	3.4-1, 110	Piping, piping components	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VIII.E.SP-90	3.4-1, 16	Piping, piping components	Aluminum	Treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.E.SP-8	3.4-1, 27	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No

VIII Table E — STEAM POWER CONVERSION SYSTEM — Condensate System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VIII.E.SP-92	3.4-1, 43	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.E.SP-31	3.4-1, 20	Piping, piping components	Copper alloy	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VIII.E.SP-29	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.E.SP-30	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VIII.E.S-439	3.4-1, 92	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VIII.E.S-440	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.E.SP-55	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No

VIII Table E	STEAM POWER CONVERSION SYSTEM Condensate System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.E.SP-26	3.4-1, 32	Piping, piping components	Gray cast iron	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.E.SP-27	3.4-1, 33	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.E.SP-118	3.4-1, 2	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.E.SP-127	3.4-1, 3	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.E.SP-39	3.4-1, 26	Piping, piping components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VIII.E.SP-54	3.4-1, 23	Piping, piping components	Stainless steel	Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VIII.E.SP-95	3.4-1, 44	Piping, piping components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time	No

VIII Table E **STEAM POWER CONVERSION SYSTEM**
Condensate System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Inspection"	
M	VIII.E.SP-36	3.4-1, 20	Piping, piping components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VIII.E.SP-87	3.4-1, 85	Piping, piping components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VIII.E.SP-88	3.4-1, 11	Piping, piping components	Stainless steel	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VIII.E.S-420	3.4-1, 72	Piping, piping components	Stainless steel, aluminum	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VIII.E.SP-94	3.4-1, 49	Piping, piping components	Stainless steel, nickel alloy	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VIII.E.SP-91	3.4-1, 40	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32,	No

VIII Table E — STEAM POWER CONVERSION SYSTEM
Condensate System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							"One-Time Inspection"	
M	VIII.E.SP-73	3.4-1, 14	Piping, piping components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.E.S-16	3.4-1, 5	Piping, piping components	Steel	Treated water	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
N	VIII.E.S-436	3.4-1, 89	Piping, piping components (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy	Raw water	Loss of material due to general (steel and copper alloy only), pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VIII.E.S-401	3.4-1, 66	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No

VIII Table E	STEAM POWER CONVERSION SYSTEM Condensate System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.E.S-414	3.4-1, 67	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.E.S-400	3.4-1, 61	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	VIII.E.SP-145	3.4-1, 47	Piping, piping components; tanks	Steel (with coating or wrapping), stainless steel, nickel alloy	Soil, concrete	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VIII.E.SP-81	3.4-1, 85	PWR heat exchanger components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VIII.E.SP-78	3.4-1, 14	PWR heat exchanger components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VIII.E.S-429	3.4-1, 78	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in	No

VIII Table E — STEAM POWER CONVERSION SYSTEM — Condensate System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Miscellaneous Piping and Ducting Components"	
N	VIII.E.S-459	3.4-1, 111	Tanks	Aluminum	Raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
N	VIII.E.S-441	3.4-1, 93	Tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VIII.E.SP-162	3.4-1, 83	Tanks	Stainless steel	Treated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
	VIII.E.SP-97	3.4-1, 11	Tanks	Stainless steel	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
	VIII.E.S-31	3.4-1, 29	Tanks	Steel	Air – outdoor (External)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	No

VIII Table E	STEAM POWER CONVERSION SYSTEM Condensate System							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VIII.E.SP-75	3.4-1, 12	Tanks	Steel	Treated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VIII.E.S-445	3.4-1, 97	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Air (external)	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes
N	VIII.E.S-444	3.4-1, 96	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	VIII.E.S-450	3.4-1, 102	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Soil, concrete, air – outdoor, air – indoor uncontrolled, air – indoor controlled, raw water, waste water, condensation	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VIII.E.S-448	3.4-1, 100	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air – outdoor, air – indoor uncontrolled, air – indoor controlled, condensation (external)	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes

VIII Table E	STEAM POWER CONVERSION SYSTEM Condensate System							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VIII.E.S-446	3.4-1, 98	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air, air – outdoor, air – indoor uncontrolled, moist air, condensation (external)	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VIII.E.S-449	3.4-1, 101	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	VIII.E.S-447	3.4-1, 99	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M29, "Aboveground Metallic Tanks"	No
M	VIII.E.SP-115	3.4-1, 30	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel	Soil, concrete, air – outdoor, air – indoor uncontrolled, moist air, condensation (external)	Loss of material due to general, pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M29, "Aboveground Metallic Tanks"	No
M	VIII.E.S-405	3.4-1, 62	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel, stainless steel, aluminum	Treated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M29, "Aboveground Metallic Tanks"	No

VIII STEAM POWER CONVERSION SYSTEM
Table E Condensate System

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
D	VIII.E.S-402							
D	VIII.E.SP-137							
D	VIII.E.SP-138							
D	VIII.E.SP-139							
D	VIII.E.SP-140							

F. STEAM GENERATOR BLOWDOWN SYSTEM (PRESSURIZED WATER REACTOR)

Systems, Structures, and Components

This section addresses the steam generator (SG) blowdown system for pressurized water reactors (PWRs), which extends from the SG through the blowdown condenser and includes the containment isolation valves and small bore piping less than nominal pipe size (NPS) 2 in. (including instrumentation lines).

Based on Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," the portion of the blowdown system extending from the SG up to the isolation valve outside the containment and including the isolation valves is governed by Group B or C Quality Standards. The remaining portions of the SG blowdown system consist of components governed by Group D Quality Standards.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of the external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material/environment combinations, where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation, are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the blowdown system include the SG (IV.D1 and IV.D2) and the open- or closed-cycle cooling water (CCCW) systems (VII.C1 or VII.C2).

VIII STEAM POWER CONVERSION SYSTEM
Table F Steam Generator Blowdown System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VIII.F.S-432	3.4-1, 81	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
	VIII.F.SP-56	3.4-1, 22	Heat exchanger components	Copper alloy	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VIII.F.S-25	3.4-1, 26	Heat exchanger components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VIII.F.SP-117	3.4-1, 19	Heat exchanger components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
	VIII.F.SP-85	3.4-1, 11	Heat exchanger components	Stainless steel	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.F.S-23	3.4-1, 25	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VIII.F.SP-146	3.4-1, 19	Heat exchanger components	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC;	AMP XI.M20, "Open-Cycle Cooling Water System"	No

VIII STEAM POWER CONVERSION SYSTEM
Table F Steam Generator Blowdown System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
						fouling that leads to corrosion; flow blockage due to fouling		
N	VIII.F.S-437	3.4-1, 90	Heat exchanger components (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy	Raw water	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VIII.F.SP-100	3.4-1, 17	Heat exchanger tubes	Copper alloy	Treated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
	VIII.F.SP-41	3.4-1, 28	Heat exchanger tubes	Stainless steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
	VIII.F.S-28	3.4-1, 22	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
	VIII.F.SP-96	3.4-1, 18	Heat exchanger tubes	Stainless steel	Treated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

VIII Table F — STEAM POWER CONVERSION SYSTEM — Steam Generator Blowdown System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VIII.F.SP-64	3.4-1, 28	Heat exchanger tubes	Steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
N	VIII.F.S-438	3.4-1, 91	Heat exchanger tubes (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy	Raw water	Loss of material due to general (steel and copper alloy only), pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VIII.F.S-415	3.4-1, 68	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
N	VIII.F.S-458	3.4-1, 110	Piping, piping components	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VIII.F.SP-90	3.4-1, 16	Piping, piping components	Aluminum	Treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32,	No

VIII STEAM POWER CONVERSION SYSTEM
Table F Steam Generator Blowdown System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							"One-Time Inspection"	
M	VIII.F.SP-8	3.4-1, 27	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VIII.F.SP-31	3.4-1, 20	Piping, piping components	Copper alloy	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VIII.F.SP-101	3.4-1, 16	Piping, piping components	Copper alloy	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.F.SP-29	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.F.SP-30	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VIII.F.S-439	3.4-1, 92	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No

VIII Table F	STEAM POWER CONVERSION SYSTEM Steam Generator Blowdown System (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VIII.F.S-440	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.F.SP-55	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.F.SP-27	3.4-1, 33	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.F.SP-118	3.4-1, 2	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.F.SP-127	3.4-1, 3	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.F.SP-39	3.4-1, 26	Piping, piping components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VIII.F.SP-54	3.4-1, 23	Piping, piping components	Stainless steel	Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No

VIII STEAM POWER CONVERSION SYSTEM
Table F Steam Generator Blowdown System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VIII.F.SP-36	3.4-1, 20	Piping, piping components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VIII.F.SP-87	3.4-1, 85	Piping, piping components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VIII.F.SP-88	3.4-1, 11	Piping, piping components	Stainless steel	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.F.SP-74	3.4-1, 13	Piping, piping components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.F.S-16	3.4-1, 5	Piping, piping components	Steel	Treated water	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
N	VIII.F.S-436	3.4-1, 89	Piping, piping components (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy	Raw water	Loss of material due to general (steel and copper alloy only), pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VIII STEAM POWER CONVERSION SYSTEM
Table F Steam Generator Blowdown System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VIII.F.S-401	3.4-1, 66	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.F.S-414	3.4-1, 67	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.F.S-400	3.4-1, 61	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	VIII.F.SP-81	3.4-1, 85	PWR heat exchanger components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VIII.F.SP-78	3.4-1, 14	PWR heat exchanger components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

VIII STEAM POWER CONVERSION SYSTEM
Table F Steam Generator Blowdown System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VIII.F.S-459	3.4-1, 111	Tanks	Aluminum	Raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
N	VIII.F.S-441	3.4-1, 93	Tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
D	VIII.F.S-402							

G. AUXILIARY FEEDWATER SYSTEM (PRESSURIZED WATER REACTOR)

Systems, Structures, and Components

This section addresses the auxiliary feedwater (AFW) system for pressurized water reactors (PWRs), which extends from the condensate storage or backup water supply system to the steam generator (SG) or to the main feedwater (FW) line. They consist of AFW piping, AFW pumps, pump turbine oil coolers, and valves, including the containment isolation valves.

Based on Regulatory Guide (RG) 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” portions of the AFW system extending from the secondary side of the SG up to the second isolation valve and including the containment isolation valves are governed by Group B Quality Standards. In addition, portions of the AFW system that are required for their safety functions and that either do not operate during any mode of normal reactor operation or cannot be tested adequately are also governed by Group B Quality Standards. The remainder of the structures and components covered in this section are governed by Group C Quality Standards.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. They are subject to replacement based on qualified life or a specified time period. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review (AMR).

The aging management programs (AMPs) for the degradation of the external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material/environment combinations, where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation, are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the AFW system include the SG (IV.D1 and IV.D2), the main steam (MS) system (VIII.B1), the PWR FW system (VIII.D1), the condensate system (VIII.E), and the open- or closed-cycle cooling water (CCCW) systems (VII.C1 or VII.C2).

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
N	VIII.G.S-432	3.4-1, 81	Any	Steel	Treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No
N	VIII.G.S-421	3.4-1, 73	Bolting	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VIII.G.S-25	3.4-1, 26	Heat exchanger components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
	VIII.G.SP-79	3.4-1, 44	Heat exchanger components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.G.SP-117	3.4-1, 19	Heat exchanger components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VIII.G.S-23	3.4-1, 25	Heat exchanger components	Steel	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	VIII.G.SP-76	3.4-1, 41	Heat exchanger components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.G.SP-146	3.4-1, 19	Heat exchanger components	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
N	VIII.G.S-438	3.4-1, 91	Heat exchanger components (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy	Raw water	Loss of material due to general (steel and copper alloy only), pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VIII.G.S-437	3.4-1, 90	Heat exchanger components (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy	Raw water	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
	VIII.G.SP-113	3.4-1, 45	Heat exchanger components and tubes	Aluminum	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
N	VIII.G.S-433	3.4-1, 86	Heat exchanger components internal to components	Stainless steel, steel, aluminum, copper alloy, titanium	Air (external)	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
	VIII.G.SP-99	3.4-1, 46	Heat exchanger tubes	Copper alloy	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
	VIII.G.SP-56	3.4-1, 22	Heat exchanger tubes	Copper alloy	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
	VIII.G.SP-100	3.4-1, 18	Heat exchanger tubes	Copper alloy	Treated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VIII.G.SP-41	3.4-1, 28	Heat exchanger tubes	Stainless steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
	VIII.G.SP-102	3.4-1, 46	Heat exchanger tubes	Stainless steel	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
	VIII.G.S-28	3.4-1, 22	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
	VIII.G.SP-64	3.4-1, 28	Heat exchanger tubes	Steel	Closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No
	VIII.G.SP-103	3.4-1, 46	Heat exchanger tubes	Steel	Lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
	VIII.G.S-27	3.4-1, 22	Heat exchanger tubes	Steel	Raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VIII.G.S-415	3.4-1, 68	Piping components with internal coatings/linings	Gray cast iron with internal coating/lining	Closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping	No

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
							Components, Heat Exchangers, and Tanks"	
N	VIII.G.S-458	3.4-1, 110	Piping, piping components	Aluminum	Air – outdoor, raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
M	VIII.G.SP-114	3.4-1, 42	Piping, piping components	Aluminum	Lubricating oil	Loss of material due to pitting, crevice corrosion	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.G.SP-90	3.4-1, 16	Piping, piping components	Aluminum	Treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.G.S-408	3.4-1, 60	Piping, piping components	Any	Treated water	Wall thinning due to erosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
M	VIII.G.SP-8	3.4-1, 27	Piping, piping components	Copper alloy	Closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.G.SP-92	3.4-1, 43	Piping, piping components	Copper alloy	Lubricating oil	Loss of material due to general, pitting, crevice corrosion	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.G.SP-31	3.4-1, 20	Piping, piping components	Copper alloy	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VIII.G.SP-29	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.G.SP-30	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VIII.G.S-439	3.4-1, 92	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
N	VIII.G.S-440	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.G.SP-55	3.4-1, 33	Piping, piping components	Copper alloy (>15% Zn or >8% Al)	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.G.SP-28	3.4-1, 33	Piping, piping components	Gray cast iron	Raw water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.G.SP-26	3.4-1, 32	Piping, piping components	Gray cast iron	Soil, ground water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.G.SP-27	3.4-1, 33	Piping, piping components	Gray cast iron	Treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No
M	VIII.G.SP-118	3.4-1, 2	Piping, piping components	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.G.SP-127	3.4-1, 3	Piping, piping components	Stainless steel	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.G.SP-39	3.4-1, 26	Piping, piping components	Stainless steel	Closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No
M	VIII.G.SP-54	3.4-1, 23	Piping, piping components	Stainless steel	Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.G.SP-95	3.4-1, 44	Piping, piping components	Stainless steel	Lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.G.SP-36	3.4-1, 20	Piping, piping components	Stainless steel	Raw water	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No
M	VIII.G.SP-87	3.4-1, 85	Piping, piping components	Stainless steel	Treated water	Loss of material due to pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
M	VIII.G.SP-88	3.4-1, 11	Piping, piping components	Stainless steel	Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VIII.G.S-420	3.4-1, 72	Piping, piping components	Stainless steel, aluminum	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
M	VIII.G.SP-94	3.4-1, 49	Piping, piping components	Stainless steel, nickel alloy	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.G.SP-60	3.4-1, 37	Piping, piping components	Steel	Condensation (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VIII.G.SP-91	3.4-1, 40	Piping, piping components	Steel	Lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No
M	VIII.G.SP-136	3.4-1, 38	Piping, piping components	Steel	Raw water	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VIII.G.S-11	3.4-1, 1	Piping, piping components	Steel	Treated water	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes
M	VIII.G.SP-74	3.4-1, 13	Piping, piping components	Steel	Treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.G.S-16	3.4-1, 5	Piping, piping components	Steel	Treated water	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No
N	VIII.G.S-436	3.4-1, 89	Piping, piping components (for components not covered by NRC GL 89-13)	Steel, stainless steel, copper alloy	Raw water	Loss of material due to general (steel and copper alloy only), pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
M	VIII.G.S-401	3.4-1, 66	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage, spalling for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No
M	VIII.G.S-414	3.4-1, 67	Piping, piping components, heat exchangers, tanks with internal coatings/linings	Any material with an internal coating/lining	Closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC; fouling that leads to corrosion; cracking due to stress corrosion cracking	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.G.S-400	3.4-1, 61	Piping, piping components; tanks	Metallic	Raw water, waste water	Loss of material due to recurring internal corrosion	Plant-specific aging management program	Yes
M	VIII.G.SP-145	3.4-1, 47	Piping, piping components; tanks	Steel (with coating or wrapping), stainless steel, nickel alloy	Soil, concrete	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
N	VIII.G.S-429	3.4-1, 78	Seals, piping, piping components	Elastomer	Condensation	Hardening and loss of strength due to elastomer degradation	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No
N	VIII.G.S-459	3.4-1, 111	Tanks	Aluminum	Raw water, waste water, condensation (internal)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes
N	VIII.G.S-441	3.4-1, 93	Tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VIII.G.SP-162	3.4-1, 83	Tanks	Stainless steel	Treated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	Plant-specific aging management program	Yes
	VIII.G.S-31	3.4-1, 29	Tanks	Steel	Air – outdoor (External)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	No
M	VIII.G.SP-75	3.4-1, 12	Tanks	Steel	Treated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No
N	VIII.G.S-445	3.4-1, 97	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Air (external)	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes
N	VIII.G.S-444	3.4-1, 96	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	VIII.G.S-450	3.4-1, 102	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Aluminum	Soil, concrete, air – outdoor, air – indoor uncontrolled, air – indoor controlled, raw water,	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes

VIII Table G — STEAM POWER CONVERSION SYSTEM
Auxiliary Feedwater System (PWR)

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
					waste water, condensation			
N	VIII.G.S-448	3.4-1, 100	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air – outdoor, air – indoor uncontrolled, air – indoor controlled, condensation (external)	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VIII.G.S-446	3.4-1, 98	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Air, air – outdoor, air – indoor uncontrolled, moist air, condensation (external)	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Aboveground Metallic Tanks"	Yes
N	VIII.G.S-449	3.4-1, 101	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M29, "Aboveground Metallic Tanks"	No
N	VIII.G.S-447	3.4-1, 99	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Stainless steel	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M29, "Aboveground Metallic Tanks"	No
M	VIII.G.SP-116	3.4-1, 30	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel	Soil, concrete, air – outdoor, air – indoor uncontrolled,	Loss of material due to general, pitting, crevice corrosion, MIC (soil environment	AMP XI.M29, "Aboveground Metallic Tanks"	No

VIII Table G	STEAM POWER CONVERSION SYSTEM Auxiliary Feedwater System (PWR)							
New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
					moist air, condensation (external)	only)		
M	VIII.G.S-405	3.4-1, 62	Tanks within the scope of AMP XI.M29, "Aboveground Metallic Tanks"	Steel, stainless steel, aluminum	Treated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M29, "Aboveground Metallic Tanks"	No
D	VIII.G.S-402							

H. EXTERNAL SURFACES OF COMPONENTS AND MISCELLANEOUS BOLTING

Systems, Structures, and Components

This section includes the aging management programs (AMPs) for the degradation of external surfaces of structures and components, including closure bolting in the steam and power conversion systems in pressurized water reactors (PWRs) and boiling water reactors (BWRs). For the steel components in PWRs, this section addresses only boric acid corrosion of external surfaces as a result of dripping borated water leaking from an adjacent PWR component.

System Interfaces

The structures and components (SCs) covered in this section belong to the Steam and Power Conversion Systems in PWRs and BWRs (for example, see system interfaces in VIII.A to VIII.G for details).

VIII STEAM POWER CONVERSION SYSTEM
Table H External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VIII.H.SP-149	3.4-1, 10	Bolting	Copper alloy	Any environment	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	VIII.H.S-418	3.4-1, 70	Bolting	Copper alloy	Raw water, waste water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M18, "Bolting Integrity"	No
	VIII.H.SP-150	3.4-1, 10	Bolting	Nickel alloy	Any environment	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
M	VIII.H.SP-144	3.4-1, 6	Bolting	Stainless Steel	Soil	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
M	VIII.H.SP-143	3.4-1, 48	Bolting	Stainless steel, nickel alloy	Soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
	VIII.H.S-40	3.4-1, 4	Bolting	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No
N	VIII.H.S-419	3.4-1, 71	Bolting	Steel	Lubricating Oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M18, "Bolting Integrity"	No

VIII STEAM POWER CONVERSION SYSTEM
Table H External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VIII.H.SP-142	3.4-1, 6	Bolting	Steel	Soil	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
M	VIII.H.SP-141	3.4-1, 50	Bolting	Steel	Soil, concrete	Loss of material due to general, pitting, crevice corrosion, MIC (soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No
	VIII.H.SP-82	3.4-1, 8	Bolting	Steel; stainless steel	Air – outdoor (External)	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M18, "Bolting Integrity"	No
	VIII.H.SP-151	3.4-1, 10	Bolting	Steel; stainless steel	Air – outdoor (External)	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	VIII.H.S-416	3.4-1, 69	Bolting	Steel; stainless steel	Condensation	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
N	VIII.H.S-417	3.4-1, 69	Bolting	Steel; stainless steel	Lubricating Oil	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No

VIII STEAM POWER CONVERSION SYSTEM
Table H External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VIII.H.S-03	3.4-1, 7	Closure bolting	High-strength steel	Air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	AMP XI.M18, "Bolting Integrity"	No
	VIII.H.S-02	3.4-1, 9	Closure bolting	Steel	Air with steam or water leakage	Loss of material due to general corrosion	AMP XI.M18, "Bolting Integrity"	No
	VIII.H.SP-84	3.4-1, 8	Closure bolting	Steel; stainless steel	Air – indoor uncontrolled (external)	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M18, "Bolting Integrity"	No
	VIII.H.SP-83	3.4-1, 10	Closure bolting	Steel; stainless steel	Air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, or self-loosening	AMP XI.M18, "Bolting Integrity"	No
M	VIII.H.S-29	3.4-1, 34	External surfaces	Steel	Air – indoor uncontrolled (external)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VIII.H.S-41	3.4-1, 34	External surfaces	Steel	Air – outdoor (External)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
	VIII.H.S-30	3.4-1, 4	External surfaces	Steel	Air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No

VIII STEAM POWER CONVERSION SYSTEM
Table H External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	VIII.H.S-42	3.4-1, 34	External surfaces	Steel	Condensation (External)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VIII.H.S-426	3.4-1, 75	Heat exchanger components	Stainless steel, steel, aluminum, copper alloy, titanium	Air (external)	Reduction of heat transfer due to fouling	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VIII.H.S-451	3.4-1, 103	Insulated piping, piping components, tanks	Stainless steel	Condensation, air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.H.S-402	3.4-1, 63	Insulated piping, piping components, tanks	Steel, copper alloy, copper alloy (> 15% Zn), aluminum	Condensation, air – outdoor	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion; cracking due to stress corrosion cracking (copper alloy (>15% Zn) only)	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VIII.H.S-453	3.4-1, 105	Insulated tanks	Aluminum	Condensation, air – outdoor, air – indoor uncontrolled, air – indoor	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical	Yes

VIII STEAM POWER CONVERSION SYSTEM
Table H External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
					controlled		Components"	
N	VIII.H.S-452	3.4-1, 104	Insulated tanks	Stainless steel	Condensation, air – outdoor, air – indoor uncontrolled, air – indoor controlled	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
M	VIII.H.S-403	3.4-1, 64	Jacketed insulation	Any	Air – indoor uncontrolled or air – outdoor, air with reactor coolant leakage, air with steam or water leakage	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
M	VIII.H.SP-147	3.4-1, 35	Piping, piping components	Aluminum	Air – outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VIII.H.S-431	3.4-1, 80	Piping, piping components	Stainless steel, steel, nickel alloy, copper alloy, aluminum	Condensation	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No

VIII Table H — STEAM POWER CONVERSION SYSTEM
External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	VIII.H.S-454	3.4-1, 106	Piping, piping components	Steel, stainless steel, copper alloy, copper alloy (> 15% Zn), nickel alloy	Air – outdoor	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion; cracking due to stress corrosion cracking (copper alloy (>15% Zn) only)	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VIII.H.S-457	3.4-1, 109	Piping, piping components, tanks	Aluminum	Condensation, raw water, waste water	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
N	VIII.H.S-456	3.4-1, 108	Piping, piping components, tanks	Stainless steel	Condensation	Cracking due to stress corrosion cracking	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes
N	VIII.H.S-428	3.4-1, 77	Seals, piping, piping components	Elastomer	Air – outdoor	Hardening and loss of strength due to elastomer degradation	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No
N	VIII.H.S-455	3.4-1, 107	Tanks	Steel, stainless steel, copper alloy, copper alloy (> 15%	Condensation	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion;	AMP XI.M36, "External Surfaces Monitoring of Mechanical	No

VIII Table H — STEAM POWER CONVERSION SYSTEM
External Surfaces of Components and Miscellaneous Bolting

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
				Zn), nickel alloy		cracking due to stress corrosion cracking (copper alloy (>15% Zn) only)	Components"	
N	VIII.H.S-442	3.4-1, 94	Underground piping, piping components	Aluminum	Air (external)	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes
N	VIII.H.S-443	3.4-1, 95	Underground piping, piping components	Stainless steel	Air-indoor uncontrolled, condensation, air-outdoor (external)	Loss of material due to pitting, crevice corrosion	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
M	VIII.H.SP-161	3.4-1, 50x	Underground piping, piping components	Steel, nickel alloy, copper alloy	Air – indoor uncontrolled, condensation, air-outdoor (external)	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion	AMP XI.M41, "Buried and Underground piping and Tanks"	No
N	VIII.H.S-460	3.4-1, 112	Underground piping, piping components, tanks	Aluminum	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes
N	VIII.H.S-425	3.4-1, 74	Underground piping, piping components, tanks	Stainless steel	Air – outdoor	Cracking due to stress corrosion cracking	AMP XI.M41, "Buried and Underground Piping and Tanks"	Yes

I. COMMON MISCELLANEOUS MATERIAL/ENVIRONMENT COMBINATIONS

Systems, Structures, and Components

This section includes the aging management programs (AMPs) for miscellaneous material/environment combinations which may be found throughout the steam and power conversion system's structures and components (SCs). For the material/environment combinations in this part, aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation. With the exception of components within the scope of American Society of Mechanical Engineers (ASME) Section XI, no AMPs for these structures and components are required.

System Interfaces

The SCs covered in this section belong to the steam and power conversion system in pressurized water reactors (PWRs) and boiling water reactors (BWRs) (for example, see system interfaces in VIII.A to VIII.H for details).

VIII STEAM POWER CONVERSION SYSTEM
Table I Common Miscellaneous Material/Environment Combinations

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VIII.I.SP-33	3.4-1, 55	Piping elements	Glass	Air	None	None	No
	VIII.I.SP-9	3.4-1, 55	Piping elements	Glass	Air – indoor uncontrolled (external)	None	None	No
	VIII.I.SP-108	3.4-1, 55	Piping elements	Glass	Air – outdoor	None	None	No
	VIII.I.SP-67	3.4-1, 55	Piping elements	Glass	Air with borated water leakage	None	None	No
	VIII.I.SP-70	3.4-1, 55	Piping elements	Glass	Closed-cycle cooling water	None	None	No
	VIII.I.SP-68	3.4-1, 55	Piping elements	Glass	Condensation	None	None	No
	VIII.I.SP-69	3.4-1, 55	Piping elements	Glass	Gas	None	None	No
	VIII.I.SP-10	3.4-1, 55	Piping elements	Glass	Lubricating oil	None	None	No
	VIII.I.SP-34	3.4-1, 55	Piping elements	Glass	Raw water	None	None	No

VIII STEAM POWER CONVERSION SYSTEM

Table I Common Miscellaneous Material/Environment Combinations

New (N), Modified (M), Deleted (D) Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	VIII.I.SP-35	3.4-1, 55	Piping elements	Glass	Treated water	None	None	No
N	VIII.I.S-461	3.4-1, 113	Piping, piping components	Aluminum	Air – indoor uncontrolled	Loss of material due to pitting, crevice corrosion	Plant-specific aging management program	Yes
M	VIII.I.SP-23	3.4-1, 52	Piping, piping components	Aluminum	Gas	None	None	No
M	VIII.I.SP-6	3.4-1, 54	Piping, piping components	Copper alloy	Air – indoor uncontrolled (external)	None	None	No
M	VIII.I.SP-104	3.4-1, 53	Piping, piping components	Copper alloy	Air with borated water leakage	None	None	No
M	VIII.I.SP-5	3.4-1, 54	Piping, piping components	Copper alloy	Gas	None	None	No
N	VIII.I.S-435	3.4-1, 88	Piping, piping components	Copper alloy (≤8% Al)	Air with borated water leakage	None	None	No
M	VIII.I.SP-11	3.4-1, 56	Piping, piping components	Nickel alloy	Air – indoor uncontrolled (external)	None	None	No
M	VIII.I.SP-148	3.4-1, 57	Piping, piping components	Nickel alloy	Air with borated water leakage	None	None	No

VIII Table I	STEAM POWER CONVERSION SYSTEM Common Miscellaneous Material/Environment Combinations							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
M	VIII.I.SP-152	3.4-1, 57	Piping, piping components	PVC	Air – indoor uncontrolled	None	None	No
M	VIII.I.SP-153	3.4-1, 57	Piping, piping components	PVC	Condensation (internal)	None	None	No
M	VIII.I.SP-12	3.4-1, 58	Piping, piping components	Stainless steel	Air – indoor uncontrolled (external)	None	None	No
M	VIII.I.SP-86	3.4-1, 58	Piping, piping components	Stainless steel	Air – indoor uncontrolled (internal)	None	None	No
M	VIII.I.SP-13	3.4-1, 82	Piping, piping components	Stainless steel	Concrete	None	None	Yes
M	VIII.I.SP-15	3.4-1, 58	Piping, piping components	Stainless steel	Gas	None	None	No
M	VIII.I.SP-1	3.4-1, 59	Piping, piping components	Steel	Air – indoor controlled (external)	None	None	No
M	VIII.I.SP-154	3.4-1, 51	Piping, piping components	Steel	Concrete	None	None	Yes
M	VIII.I.SP-4	3.4-1, 59	Piping, piping components	Steel	Gas	None	None	No

VIII Table I	STEAM POWER CONVERSION SYSTEM Common Miscellaneous Material/Environment Combinations							
New (N), Modified (M), Deleted (D) Item	**Item**	**SRP Item (Table, ID)**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation**
D	VIII.I.S-404							
D	VIII.I.SP-111							
D	VIII.I.SP-93							

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10. SUPPLEMENTARY NOTES

11. ABSTRACT (200 words or less)

The Generic Aging lessons Learned for Subsequent License Renewal (GALL-SLR) Report contains the staff's generic evaluation of the aging management programs for subsequent license renewal (i.e., for operation from 60 to 80 years). The guidance documents for first license renewal (i.e., for operation from 40 to 60 years) have been reviewed to determine where the programs for first license renewal should be augmented for subsequent license renewal. The report recognizes that there will be new issues due to long-term exposure to radiation and high temperature that will present new challenges to nuclear power plant managers in maintaining safety. This document identifies the structures and components in the scope of license renewal and provides generic programs for addressing these aging issues. Where it was not possible to develop a generic program, this document suggests that aging issues be addressed by a further evaluation or a plant-specific aging management program. The aging management programs in this document are intended for utilities wishing to submit subsequent license renewal applications. However, the programs described in this document may be used for applications for first license renewal.

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