ENERGY NORTHWEST

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GO2-11-025

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397**
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
LICENSE RENEWAL APPLICATION

References:
1) Letter, GO2-10-11, dated January 19, 2010, WS Oxenford (Energy Northwest) to NRC, "License Renewal Application"

2) Letter dated November 5, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML103010080)

3) Letter, GO2-10-169, dated November 23, 2010, SK Gambhir (Energy Northwest), "Response to Request for Additional Information, License Renewal Application," (ADAMS Accession No. ML103280370)

4) Letter, GO2-10-179, dated December 21, 2010, SK Gambhir (Energy Northwest), "Response to Request for Additional Information, License Renewal Application," (ADAMS Accession No. ML103620326)

5) Letter, GO2-11-11, dated January 14, 2011, SK Gambhir (Energy Northwest), "Response to Request for Additional Information, License Renewal Application," (response to November 1 letter)

6) Letter, GO2-11-16 dated January 20, 2011, SK Gambhir (Energy Northwest), "Response to Request for Additional Information, License Renewal Application," (response to October 20 letter)

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Dear Sir or Madam:

By Reference 1, Energy Northwest requested the renewal of the Columbia Generating Station (Columbia) operating license. Via Reference 2, the Nuclear Regulatory Commission (NRC) requested additional information related to the Energy Northwest submittal.

Transmitted herewith in the attachment is the Energy Northwest response to the Request for Additional Information (RAI) contained in Reference 2. The RAI in Reference 2 was specific to the Cooling Unit Inspection Program, requesting a justification for a one-time inspection rather than a periodic inspection program. References 3, 4, 5, and 6 deferred responses to similar RAIs about the Diesel System Inspection, Diesel-Driven Fire Pump Inspection, Flexible Connections Inspection, Monitoring and Collection Systems, and Service Air Inspection.

In RAI B.2.14-1, the NRC requested that Energy Northwest justify how the one-time inspection satisfied one of the following criteria for the use of a one-time inspection program: (a) the aging effect is not expected to occur but the data is insufficient to rule it out with reasonable confidence; (b) the aging effect is expected to progress very slowly in the specified environment, but the local environment may be more adverse than that generally expected; and (c) the characteristics of the aging effect include a long incubation period. Energy Northwest determined that, for the 6 programs, the site-specific operating experience has not identified an aging effect, but that the data is insufficient to rule it out with reasonable confidence. However, based on reviews of the Generic Aging Lessons Learned (GALL) Report, NUREG 1801, revision 2, Energy Northwest is revising the LRA to change the 6 one-time inspections to base-line inspections prior to the period of extended operation (PEO) with subsequent opportunistic inspections of components within the program scope during the PEO. The programs include a provision to verify that each material and environment combination is inspected with in a specified time frame.

Enclosures 1 through 6 contain the applicable revised pages of Amendment 21 to the LRA. Each enclosure contains the revised pages for one of the programs modified in response to the RAIs. This group of 6 enclosures is provided to aid in the review of the individual RAIs. Six revised commitments are included in this response.

If you have any questions or require additional information, please contact Abbas Mostala at (509) 377-4197.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the date of this letter.

Respectfully,

Jack L. Heiler
For
SK Gambhir
Vice President, Engineering

Attachment: Response to Request for Additional Information

Enclosure 1	LRA Amendment 21 for Cooling Units Inspection Program
Enclosure 2	LRA Amendment 21 for Diesel Systems Inspection Program
Enclosure 3	LRA Amendment 21 for Diesel-Driven Fire Pumps Inspection Program
Enclosure 4	LRA Amendment 21 for Flexible Connections Inspection Program
Enclosure 5	LRA Amendment 21 for Monitoring & Collection Systems Inspection Program
Enclosure 6	LRA Amendment 21 for Service Air System Inspection Program

cc: NRC Region IV Administrator
NRC NRR Project Manager
NRC Senior Resident Inspector/988C
RN Sherman – BPA/1399
WA Horin – Winston & Strawn
AD Cunanan - NRC NRR (w/a)
BE Holian - NRC NRR
EFSEC Manager
RR Cowley – WDOH

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

"Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application,"
(ADAMS Accession No. ML103010080)

Kichline

RAI B.2.14-1

Background:

Generic Aging Lessons Learned (GALL) aging management program (AMP) XI.M32 states that use of a one-time inspection is appropriate when (a) an aging effect is not expected to occur but the data is insufficient to rule it out with reasonable confidence; (b) an aging effect is expected to progress very slowly in the specified environment, but the local environment may be more adverse than that generally expected; or (c) the characteristics of the aging effect include a long incubation period. GALL AMP XI.M32 also states that for these cases, the one-time inspection should provide confirmation that either the aging effect is indeed not occurring, or the aging effect is occurring very slowly so as not to affect the component or structure's intended function during the period of extended operation. GALL AMP XI.M32 also states that one-time inspections may be used to verify the system-wide effectiveness of an AMP at inspection locations in the system or component based on the aging effect.

In license renewal application (LRA) Section B.2.14, the applicant stated that its Cooling Unit Inspection Program will be used to detect and characterize the material conditions of aluminum, steel, copper alloy and stainless steel cooling unit components that are exposed to condensation (internal or external) environment. The applicant also stated that the inspection would provide direct evidence as to whether, and to what extent, a loss of material due to crevice, galvanic, general, pitting, or microbiological influenced corrosion, reduction in heat transfer due to fouling of heat exchanger tubes and fins, or cracking of aluminum components has occurred, or is likely to occur, that could result in a loss of intended function.

GALL Report item VII.G-23 recommends GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" to manage loss of material for steel piping exposed internally to moist air or condensation. GALL AMP XI.M38 includes periodic inspections of the internal surfaces of components to manage loss of material.

GALL Report items VII.F1-1, VII.F2-12, and VII.F2-14 recommend a plant-specific aging management program and require further evaluation to manage the loss of material, pitting and crevice corrosion for stainless steel, aluminum, and copper, respectively.

Issue:

It is not clear to the staff how a one-time inspection program is appropriate to manage loss of material and cracking for aluminum exposed to condensation (external) and loss of material for steel exposed to condensation (internal) given that (a) industry experience has shown that aging is expected for these material and environment combinations (b) the GALL Report recommends periodic inspection programs to manage aging for these material and environment combinations; and (c) a one-time inspection program is only to be used when an aging effect is not expected or is expected to progress very slowly.

Request:

Justify how the one-time inspections proposed by the Cooling Units Inspection Program is adequate by explaining how, for each component managed by the program, one of the following criteria for use of a one-time inspection is satisfied: (a) the aging effect is not expected to occur but the data is insufficient to rule it out with reasonable confidence; (b) the aging effect is expected to progress very slowly in the specified environment, but the local environment may be more adverse than that generally expected; and (c) the characteristics of the aging effect include a long incubation period.

Energy Northwest Response:

The Cooling Units Inspection Program was credited for steel and stainless steel Diesel Building heating, ventilation and air conditioning (HVAC) drain pans and drain piping, Pump House HVAC drain pans and piping, Radwaste Building HVAC drain pans and piping, and Reactor Building HVAC drain pans, piping and components where a loss of material is not expected to occur but the data is insufficient to rule it out with reasonable confidence, since the drain pan and drain piping internal surfaces have not been inspected. Site specific operating experience has not identified a loss of material in drain pans or piping. However, the condition of the drain pans, piping and components has not been confirmed; air handling (cooling) unit maintenance and surveillance activities have been focused on the coils but have observed no leakage. By design, cooling units are self-draining. As such, a one-time inspection was credited for these components to verify that there are no aging effects requiring management for the subject components or to identify appropriate corrective actions, including possible programmatic oversight (based on the actual condition of the drain pans, piping and components).

Furthermore, as described in the first annual update of the LRA (EN Letter GO2-10-094), leakage was detected from ductwork downstream of Radwaste Building HVAC air handling unit WMA-AH-51A due to a dent in the bottom of the housing which allowed condensation to collect rather than drain off as designed. The collected water was removed but no corrosion was identified in the housing. The Cooling Units Inspection Program was also credited for the external surfaces of cooling unit coils (tubes and fins) for cooling coils WMA-CC-51A2, 51B2, 52A2, and 52B2 which are not supplied by standby service water and, as such, are not within the scope of the Open-

Cycle Cooling Water Program. Site-specific operating experience has not identified cracking, loss of material or reduction in heat transfer and the heat transfer function of the coils is not managed by another program, but the data may not be sufficient to rule out the aging effects with reasonable confidence.

As indicated by the use of generic note E (and listing of GALL Report items VII.F1-1, VII.F2-12, or VII.F2-14) or use of generic note H with no GALL report item listed, the Cooling Units Inspection Program is a plant-specific aging management program (AMP) for materials other than steel. This could have been more clearly described in LRA Appendix B.2.14. Also, industry operating experience reflected in NUREG-1801, Rev. 1 Chapter VII is more conservative in that aging is expected for components exposed to condensation. Therefore, the Cooling Units Inspection Program is modified in the attached LRA amendment to:

1. Clarify that it is a plant-specific AMP for the various materials in the scope of the program (including steel),
2. Change the one-time inspection to baseline inspections of each cooling unit material exposed to condensation prior to the period of extended operation,
3. Describe sample population selection and limits, as well as acceptance criteria,
4. Include opportunistic inspection of components within the scope of the program during maintenance, repair, or surveillance activities when surfaces are made available for inspection through the period of extended operation, and
5. Include trending of the results of these inspections to ensure that each material exposed to condensation has been examined via opportunistic inspection within a 5 year time period. If opportunistic inspections have not occurred within the 5-year interval, appropriate actions will be taken to ensure these inspections are performed

As modified, the Cooling Units Inspection Program, which is a new program for Columbia, is a combination of one-time inspections collecting baseline information on actual cooling unit material condition and opportunistic inspections thereafter to ensure that existing environmental conditions in cooling units and their drains are not causing material degradation that could result in a loss of component intended function during the period of extended operation. During the implementation phase (following receipt of the renewed license) and consistent with the response to NRC request for additional information (RAI) B.2.A-1, approved procedures will be revised or developed to direct these inspections. Per plant procedures, personnel performing VT-1, 2, or 3 inspections, ultrasonic examinations in accordance with ASME Section XI, and other nondestructive examinations in accordance with ASME Section V or Section XI are required to be trained in accordance with ASME requirements. Training requirements for all inspections will be consistent with the requirements of 10 CFR 50 Appendix B. In addition, the sample population for the baseline inspections of the Cooling Units Inspection Program will be the same as that applied to the One-Time Inspections, which verify the effectiveness of existing aging management programs, in response to NRC

RAI B.2.A-2 and B.2.A-3. Amendment 21 addressing the required changes is provided in the enclosure to this letter.

Similar situations exist for the following AMPs, where plant-specific operating experience led to the conclusion that aging effects were not expected but data may not be sufficient to rule out the aging effect(s) with reasonable confidence. No occurrences of the aging effects were identified through a review of site operating experience, but actual material condition had not been determined.

AMP	Material(s)	Environment(s)	Aging Effect(s)
Diesel Systems Inspection Program (exhaust components)	Steel Stainless steel	Air-outdoor [1], Raw water [1]	Cracking, Loss of material
Diesel-Driven Fire Pump Inspection Program (exhaust & cooling circuit components)	Copper alloy, Copper alloy > 15% Zn, Gray cast iron, Stainless steel, Steel	Air-outdoor [2], Raw water [2]	Cracking, Loss of material, Reduction in heat transfer
Flexible Connections Inspection Program (flexible connections)	Elastomer	Air-indoor uncontrolled [3], Closed-cycle cooling water, Dried air, Gas	Hardening and loss of strength, Loss of material
Monitoring & Collection Systems Inspection Program (drainage & collection components)	Copper alloy > 15% Zn, Stainless steel, Steel	Moist air, Raw water [4], Treated water, Treated water > 60°C (140°F)	Cracking, Loss of material
Service Air Inspection Program (compressed air components)	Steel	Air [5]	Loss of material

[1] Environment is predominantly outdoor air with infrequent, and for short duration, exposure to diesel exhaust. The effect of precipitation is minimized by the physical arrangement of the EDG lines and any moisture that does collect is drained via a loop seal to an equipment drain.

[2] Environment in the FP diesel exhaust lines is predominantly outdoor air with infrequent, and for short duration, exposure to diesel exhaust. The FP diesel exhaust lines are protected from precipitation by water shield caps. A cooling circuit in the FP diesels contains antifreeze, which is not chemistry controlled, is also exposed to river water (taken from the fire water supply), and is evaluated as raw water. This unique environment is not addressed by any other program.

[3] Various environments where thermal exposure or ionizing radiation may result in elastomer degradation. Elastomer degradation, such as loss of material, for flexible connections in HVAC systems exposed to uncontrolled indoor air are also included based on re-evaluation of operating experience.

[4] Raw (drainage) water, previously treated water that is no longer chemistry controlled, and plant sanitary drains with intermittent exposure to raw sewage.

[5] Compressed air that is expected to be dry, but must be confirmed due to infrequent connection to other air sources that do not have air dryers.

Appendix B section. In these situations, industry operating experience reflected in NUREG-1801 is more conservative, with aging effects expected to occur for the listed materials in the listed environments. Therefore, the above AMPs are also modified in the attached LRA amendment to:

1. Clarify that each is a plant-specific AMP,
2. Change the one-time inspection to baseline inspections of each material exposed to each environment prior to the period of extended operation,
3. Describe sample population selection and limits, as well as acceptance criteria
4. Include opportunistic inspection of components within the scope of the program during maintenance, repair, or surveillance activities through the period of extended operation, and
5. Include trending of the results of these inspections to ensure that each material and environment combination has been examined via opportunistic inspection within a 5 year time period. If opportunistic inspections have not occurred within the 5-year interval, appropriate actions will be taken to ensure these inspections are performed

As modified, the AMPS, which are new programs for Columbia, are each a combination of one-time inspections collecting baseline information on actual material conditions and opportunistic inspections thereafter to ensure that existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation. During the implementation phase (following receipt of the renewed license) and consistent with the response to NRC request for additional information (RAI) B.2.A-1, approved procedures will be revised or developed to direct these inspections. Per plant procedures, personnel performing VT-1, 2, or 3 inspections, ultrasonic examinations in accordance with ASME Section XI, and other nondestructive examinations in accordance with ASME Section V or Section XI are required to be trained in accordance with ASME requirements. Training requirements for all inspections will be consistent with the requirements of 10 CFR 50 Appendix B. In addition, the sample population for the baseline inspections will be the same as that applied to the One-Time Inspections, which verify the effectiveness of existing aging management programs, in response to NRC RAI B.2.A-2 and B.2.A-3. Amendment 21 addressing the required changes is provided in the enclosure to this letter.

In addition, updates of LRA Tables 3.3.2-14, 3.3.2-34, 3.3.2-36, 3.3.2-37 and 3.3.1, Table A-1 item 23, and Section B.2.23 are provided to relocate HVAC system flexible connections from the External Surfaces Monitoring Program to the Flexible Connection Inspection Program. Loss of material due to wear was also added as an aging effect for flexible connections in the HVAC systems based on plant-specific operating experience.

This completes the responses to the following NRC requests for additional information (RAIs):

Other Programs

Amendment 21 also includes the similar changes (specified above as items 1-5) for the additional 5 programs presented in the table below. The table lists the programs with the NRC letters. The specific RAI numbers are also provided in the table, but are not necessarily aligned with the applicable letter.

Appendix B Section	AMP	NRC Letters Date	RAIs
2.17	Diesel Systems Inspection (exhaust components)	ML102300229 (8/26/2010) ML102450727 (9/16/2010) ML102930593 (11/1/2010)	3.3.2.1-Y2 3.3.2.2.7.3-1 3.3.2.2.7.3-2 B.2.17-1
2.18	Diesel-Driven Fire Pump Inspection (exhaust & cooling circuit components)	ML102300229 (8/26/2010) ML102450727 (9/16/2010) ML102930593 (11/1/2010)	3.3.2.1-Y5 3.3.1.68-1 3.3.2.2.7.3-1 3.3.2.2.7.3-2 B.2.18-1
2.27	Flexible Connections Inspection (flexible connections)	ML102730355 (10/20/2010)	3.2.2-1 3.3.2.2.13-2
2.41	Monitoring & Collection Systems Inspection (drainage & collection components)	ML102300229 (8/26/2010) ML102450727 (9/16/2010)	3.3.2.1-Y4 3.3.2.2.7.2-1 3.3.2.2.10.2-1 3.3.1.68-1
2.48	Service Air Inspection (compressed air components)	ML102930593 (11/1/2010)	B.2.48-1

As discussed in the cover letter, plant-specific operating experience led to the conclusion that aging effects were not expected but data is insufficient to rule out the aging effect(s) with reasonable confidence. No occurrences of the aging effects were identified through a review of site operating experience, but actual material condition had not been determined. Therefore, in Amendment 21, the one-time inspections are now programs.

In addition, Amendment 21 updates of LRA Tables 3.3.2-14, 3.3.2-34, 3.3.2-36, 3.3.2-37 and 3.3.1, Table A-1 item 23, and Section B.2.23 to relocate HVAC system flexible connections from the External Surfaces Monitoring Program to the Flexible Connection Inspection Program.

LRA Amendment 21
Cooling Units Inspection Program
Revised Pages

Letter dated November 5, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML103010080)

LRA Page number	LRA Page number	LRA Page number
3.3-18	A-12	B-66a
3.3-39	A-12a	B-66b
3.3-41	A-45	B-67
3.3-42	A-45a	B-67a
3.3-54	B-3	B-67b
3.3-54a	B-14	B-68
3.3-72	B-15	B-68b
3.3-74	B-18	B-69
3.3-101	B-18b	B-69a
3.3-102	B-20	
A-3	B-66	

- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Diesel Building HVAC systems:

- Bolting Integrity Program
- Cooling Units Inspection ← Program
- External Surfaces Monitoring Program
- Open-Cycle Cooling Water Program

Add bullet for:
Flexible Connection Inspection Program

3.3.2.1.15 Diesel Cooling Water System

Materials

The materials of construction for subject mechanical components of the Diesel Cooling Water System are:

- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Glass
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Diesel Cooling Water System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Lubricating oil
- Moist air
- Raw water

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Pump House HVAC systems:

- Bolting Integrity Program
- Cooling Units Inspection ← Program
- External Surfaces Monitoring Program
- Open-Cycle Cooling Water Program

← Add bullet for: Flexible Connection Inspection Program

3.3.2.1.35 Radwaste Building Chilled Water System

Materials

The materials of construction for subject mechanical components of the Radwaste Building Chilled Water System are:

- Copper alloy
- Copper alloy > 15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Radwaste Building Chilled Water System are exposed to the following normal operating environments:

- Closed cycle cooling water
- Condensation

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Radwaste Building Chilled Water System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Radwaste Building HVAC systems:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Radwaste Building HVAC systems:

- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- Cooling Units Inspection ← Program
- External Surfaces Monitoring Program
- Heat Exchangers Inspection ← Add bullet for: Flexible Connection Inspection Program
- Open-Cycle Cooling Water Program
- Selective Leaching Inspection

3.3.2.1.37 Reactor Building HVAC Systems

Materials

The materials of construction for subject mechanical components of the Reactor Building HVAC systems are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Gray cast iron

- Stainless steel
- Steel

Environments

Subject mechanical components of the Reactor Building HVAC systems are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Condensation
- Moist air
- Raw water
- Steam

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Reactor Building HVAC systems:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Reactor Building HVAC systems:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Cooling Units Inspection ← Program
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion (FAC) Program
- Open-Cycle Cooling Water Program

Add bullet for:
Flexible Connection Inspection Program

~~submerged within the suppression pool is managed by the Monitoring and Collection Systems Inspection, which will detect and characterize loss of material.~~

~~There are no aluminum components subject to AMR in the Auxiliary systems that are exposed to treated water.~~ Replace Section with Insert A from Page 3.3-53a

Replace with Insert A on page 3.3-54a

3.3.2.2.10.3 HVAC Piping, Piping Components, and Piping Elements

The Open-Cycle Cooling Water Program is credited with the management of loss of material for copper alloy heat exchanger tubes exposed to external condensation. ~~The Cooling Units Inspection is a one-time inspection that will detect and characterize loss of material due to pitting and crevice corrosion for copper alloy HVAC heat exchanger tubes in an external environment with potential for wetting.~~ Loss of material for copper alloy piping and in-line components is managed by the External Surfaces Monitoring Program.

3.3.2.2.10.4 Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material due to pitting and crevice corrosion for copper alloy piping components exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. Loss of material for copper alloy heat exchanger components exposed to lubricating oil is also managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to pitting and crevice corrosion through examination of copper alloy piping and heat exchanger components. Copper alloys with less than 15% zinc and less than 8% aluminum are not susceptible to loss of material due to pitting or crevice corrosion and do not require management.

3.3.2.2.10.5 HVAC Piping, Piping Components, and Piping Elements and Ducting

Loss of material for aluminum and stainless steel piping and piping components, heat exchanger components, tanks, and drain pans exposed to condensation is managed by the Cooling Units Inspection, the Open-Cycle Cooling Water Program, or the External Surfaces Monitoring Program. ~~The Cooling Units Inspection is a one-time inspection that will detect and characterize loss of material for these components.~~

Program

3.3.2.2.10.6 Fire Protection System

Loss of material due to pitting and crevice corrosion is an applicable aging effect only if the materials are exposed to an aggressive environment. The only copper or copper alloy fire protection system piping components exposed to internal ambient environments are spray nozzles, strainers bodies, and valve bodies. The components are open to local ambient air conditions such that condensation will not occur and are not subject to continuous wetting or alternate wetting and drying that would constitute

flexible connections

tubing

Insert A into page 3.3-54

The Cooling Units Inspection Program manages loss of material due to pitting and crevice corrosion for copper alloy HVAC heat exchanger tubes in an external environment with potential for wetting.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-25	Copper alloy HVAC piping, piping components, piping elements exposed to condensation (external)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Except as noted below, the External Surfaces Monitoring Program is credited to manage loss of material for copper alloy piping and piping components in the auxiliary systems exposed to condensation (external). For copper alloy heat exchanger components exposed to condensation (external), the Open-Cycle Cooling Water Program is credited, if the internal environment is open-cycle cooling water. Otherwise, the Cooling Units Inspection ~~will detect and characterize loss of material~~. Refer to Section 3.3.2.2.10.3 for further information.

Program is credited

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-27	Stainless steel HVAC ducting and aluminum HVAC piping, piping components and piping elements exposed to condensation	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Except as noted, the External Surfaces Monitoring Program is credited to manage loss of material for stainless steel piping, piping components, piping elements and aluminum tanks and heat exchanger components (shells and tubes) in the auxiliary systems exposed to condensation (external). For aluminum heat exchanger components (cooling unit fins) exposed to condensation (external), the Open-Cycle Cooling Water Program is credited, if the internal environment is open-cycle cooling water. Otherwise, the Cooling Units Inspection will ~~detect and characterize~~ loss of material, including for stainless steel cooling unit drain pans and piping. Refer to Section 3.3.2.2.10.5 for further information.

Program

manage

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-71	Steel piping, piping components, and piping elements exposed to moist air or condensation (Internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Replace deleted text with Insert A from page 33-101a	No	The following programs are credited to manage loss of material for steel piping, piping components, and tanks in the auxiliary systems that are exposed to moist air or condensation (internal): • Cooling Units Inspection for drain piping in HVAC systems exposed to condensation (internal) • Monitoring and Collection Systems Inspection for air-water interfaces in Plant Sanitary Drain System piping evaluated as exposed to moist air (internal) • ~~Supplemental Piping/Tank Inspection for air-water interfaces in piping and tanks evaluated as exposed to moist air (internal)~~ A Note E is applied in each case.

Program

Program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-72	Steel HVAC ducting and components internal surfaces exposed to condensation (Internal)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	The Cooling Units Inspection is credited to ~~detect and characterize~~ manage loss of material for steel drain pans in the Pump House HVAC System that are exposed to condensation (internal). A Note E is applied.
3.3.1-73	Steel crane structural girders in load handling system exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	Consistent with NUREG-1801. The Material Handling System Inspection Program is credited to manage loss of material for steel crane structural girders in the Reactor Building that are exposed to air-indoor. This item is also applied to steel crane rails in the Reactor Building that are exposed to air-indoor. Refer to Table 3.5.2-2.

Program

manage

APPENDIX A
TABLE OF CONTENTS

A.1.2.12 Chemistry Program Effectiveness Inspection

The Chemistry Program Effectiveness Inspection detects and characterizes the condition of materials in representative low flow and stagnant areas of systems with water chemistry controlled by the BWR Water Chemistry Program or the Closed Cooling Water Chemistry Program, and with fuel oil chemistry controlled by the Fuel Oil Chemistry Program. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred. The inspection also determines whether cracking due to SCC of susceptible materials in susceptible locations has occurred.

The Chemistry Program Effectiveness Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.13 Closed Cooling Water Chemistry Program

The Closed Cooling Water Chemistry Program mitigates degradation of components that are within the scope of license renewal and contain closed cooling water. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material due to corrosion or erosion, cracking due to SCC, or reduction in heat transfer due to fouling through proper monitoring and control of corrosion inhibitor concentrations consistent with EPRI closed cooling water chemistry guidelines.

The Closed Cooling Water Chemistry Program includes corrosion rate measurement in reactor building closed cooling water locations and is supplemented by the one-time Chemistry Program Effectiveness Inspection and Heat Exchangers Inspection, which provide verification of the effectiveness of the program in managing the effects of aging.

The Closed Cooling Water Chemistry Program is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.14 Cooling Units Inspection

Program

Replace with Insert A on page A-12a

~~The Cooling Units Inspection detects and characterizes the material condition of aluminum, steel, copper alloy, and stainless steel cooling unit components that are exposed to condensation. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion, a reduction in heat transfer due to fouling of heat exchanger tubes and fins, or cracking due to SCC of aluminum components, has occurred.~~

~~The Cooling Units Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.~~

Insert A into page A-12

The Cooling Units Inspection Program manages the effects of loss of material of aluminum, steel, copper alloy, and stainless steel cooling unit components that are exposed to condensation. The inspection also manages the effects of a reduction in heat transfer due to fouling of heat exchanger tubes and fins and cracking due to SCC of aluminum components exposed to condensation.

The Cooling Units Inspection Program is a new program that will be implemented via baseline inspection of a sample population followed by opportunistic inspections when components are opened for periodic maintenance, repair, and surveillance activities when surfaces are made available for inspection. These inspections ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
13) Closed Cooling Water Chemistry Program	The Closed Cooling Water Chemistry Program is an existing program that will be continued for the period of extended operation, with the following enhancement: • Ensure that at least one additional Reactor Closed Cooling Water corrosion rate measurement is performed and evaluated prior to entering the period of extended operation to provide direct information as to the effectiveness of the chemical treatments. If necessary, based on the results, establish a frequency for subsequent measurements.	A.1.2.13	Enhancement prior to the period of extended operation. Then ongoing.
14) Cooling Units Inspection Program	~~The Cooling Units Inspection is a new activity.~~ ~~The Cooling Units Inspection detects and characterizes the material condition of cooling unit components that are exposed to condensation. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.~~	A.1.2.14	~~Within the 10-year period prior to the period of extended operation.~~
15) CRDRL Nozzle Program	The CRDRL Nozzle Program is an existing program that will be continued for the period of extended operation.	A.1.2.15	Ongoing

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The Cooling Units Inspection Program is a new program.

The Cooling Units Inspection Program manages the effects of loss of material of aluminum, steel, copper alloy, and stainless steel cooling unit components that are exposed to condensation. The inspection also manages the effects of a reduction in heat transfer due to fouling of heat exchanger tubes and fins and cracking due to SCC of aluminum components exposed to condensation.

The Cooling Unites Inspection Program consists of baseline inspections prior to the period of extended operation followed by opportunistic inspections during the period of extended operation.

Following the baseline inspection, inspection findings will be reviewed periodically to ensure that each material exposed to condensation has been examined via opportunistic inspection of actions are taken to ensure inspections are performed. Initial interval for review of inspection findings is 5 years and may be adjusted based on operating experience.

Insert B into page A-45

Implementation prior to the period of extended operation and initial inspection within the 10-year period prior to the period of extended operation. Then ongoing.

APPENDIX B
TABLE OF CONTENTS

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program See Section B.2.46.
XI.M32	One-Time Inspection	Chemistry Program Effectiveness Inspection See Section B.2.12. ~~Cooling Units Inspection See Section B.2.14.~~ ~~Diesel Driven Fire Pumps Inspection See Section B.2.18.~~ Diesel Starting Air Inspection See Section B.2.16. ~~Diesel Systems Inspection See Section B.2.17.~~ ~~Flexible Connection Inspection See Section B.2.27.~~ Heat Exchangers Inspection See Section B.2.30. Lubricating Oil Inspection See Section B.2.37. ~~Monitoring and Collection Systems Inspection See Section B.2.41.~~ ~~Service Air System Inspection See Section B.2.48.~~ Supplemental Piping/Tank Inspection See Section B.2.51.
XI.M33	Selective Leaching of Materials	Selective Leaching Inspection See Section B.2.47.
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program See Section B.2.5.
XI.M35	One-time Inspection of ASME Code Class 1 Small-Bore Piping	~~Small Bore Class 1 Piping Inspection~~ See Section B.2.49.
XI.M36	External Surfaces Monitoring	External Surfaces Monitoring Program See Section B.2.23.

Insert A from Page B-14a

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.M37	Flux Thimble Tube Inspection	Not Applicable. Columbia is a BWR design that does not utilize flux thimbles.
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Not credited for aging management. The External Surfaces Monitoring Program (See Section B.2.23) and Preventive Maintenance – RCIC Turbine Casing (See Section B.2.44) are credited instead for aging management of internal surfaces. Confirmation that aging is not occurring on internal surfaces is provided by ~~the Cooling Units Inspection (See Section B.2.14), the Monitoring and Collection Systems Inspection (See Section B.2.41), and~~ the Supplemental Piping/Tank Inspection (See Section B.2.51).
XI.M39	Lubricating Oil Analysis	Lubricating Oil Analysis Program See Section B.2.36.
XI.S1	ASME Section XI, Subsection IWE	Inservice Inspection (ISI) Program – IWE See Section B.2.34.
XI.S2	ASME Section XI, Subsection IWL	Not Applicable. Columbia has a General Electric Mark II steel containment, as described in FSAR Section 3.8.2.1.
XI.S3	ASME Section XI, Subsection IWF	Inservice Inspection (ISI) Program – IWF See Section B.2.35.
XI.S4	10 CFR Part 50, Appendix J	Appendix J Program See Section B.2.3.
XI.S5	Masonry Wall Program	Masonry Wall Inspection See Section B.2.38.
XI.S6	Structures Monitoring Program	Structures Monitoring Program See Section B.2.50.
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Water Control Structures Inspection See Section B.2.53.

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	High-Voltage Porcelain Insulators Aging Management Program See Section B.2.31.
N/A	Plant-Specific Program	Potable Water Monitoring Program See Section B.2.43.
N/A	Plant-Specific Program	Preventive Maintenance – RCIC Turbine Casing See Section B.2.44.

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Insert A from page B-18b after page B-18a from Amendment 2

Insert B from Page B-18b for Amendment 21

~~Amendment 14~~ Amendment 21

~~Amendment 2~~

Insert A to Page B-18

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	Service Level 1 Protective Coatings Program See Section B.2.55.

Insert B to Page B-18

N/A	Plant-Specific Program	Cooling Units Inspection Program See Section B.2.14.
N/A	Plant-Specific Program	Diesel Systems Inspection Program See Section B.2.17.
N/A	Plant-Specific Program	Diesel-Driven Fire Pumps Inspection Program See Section B.2.18.
N/A	Plant-Specific Program	Flexible Connection Inspection Program See Section B.2.27.
N/A	Plant-Specific Program	Monitoring and Collection Systems Inspection Program See Section B.2.41.
N/A	Plant-Specific Program	Service Air System Inspection Program See Section B.2.48.

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801
(continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
BWR Vessel Internals Program Section B.2.10	Existing	Yes	--	--	--
BWR Water Chemistry Program Section B.2.11	Existing	Yes	--	--	--
Chemistry Program Effectiveness Inspection Section B.2.12	New	Yes	--	--	--
Closed Cooling Water Chemistry Program Section B.2.13	Existing	--	Yes	--	Yes
Cooling Units Inspection Program Section B.2.14	New	~~Yes~~	--	Yes	--
CRDRL Nozzle Program Section B.2.15	Existing	Yes	--	--	--
Diesel Starting Air Inspection Section B.2.16	New	Yes	--	--	--
Diesel Systems Inspection Program Section B.2.17	New	~~Yes~~	--	Yes	--
Diesel-Driven Fire Pumps Inspection Program Section B.2.18	New	~~Yes~~	--	Yes	--

Program

B.2.14 Cooling Units Inspection

Replace with Insert A on page B-66a

Program Description

~~The Cooling Units Inspection is a new one-time inspection that will detect and characterize the material conditions of aluminum, steel, copper alloy, and stainless steel cooling unit components that are exposed to a condensation (internal or external) environment. The Cooling Units Inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, galvanic, general, pitting, or microbiologically influenced corrosion, a reduction in heat transfer due to fouling of heat exchanger tubes and fins, or cracking of aluminum components, has occurred or is likely to occur that could result in a loss of intended function.~~

of this program

Implementation ~~of the Cooling Units Inspection~~ will ensure that the pressure boundary integrity and heat transfer capability of susceptible components are maintained consistent with the current licensing basis during the period of extended operation. Implementation of the ~~inspection~~ will also provide assurance (and confirmation) that the structural integrity of susceptible NSR components will be maintained such that spatial interactions (e.g., leakage) will not result in the loss of any safety-related component intended functions during the period of extended operation.

program

Insert B on page B-66a

NUREG-1801 Consistency

~~The Cooling Units Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, "One-Time Inspection."~~

Replace with Insert C on page B-66a

Exceptions to NUREG-1801

None.

Replace with Insert D on page B-66b

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program

  ~~The Cooling Units Inspection detects and characterizes conditions relative to the following subject mechanical components to determine whether, and to what extent, degradation is occurring:~~

  - Loss of material due to crevice and pitting corrosion, and MIC of stainless steel components exposed to condensation.
  - Loss of material due to crevice, pitting, and galvanic corrosion, cracking due to SCC, and reduction in heat transfer due to fouling of aluminum heat exchanger fins exposed to condensation.

Insert A into page B-66

The Cooling Units Inspection Program is a new plant-specific program for Columbia. The program will consist of inspections of aluminum, steel, copper alloy, and stainless steel cooling unit components that are exposed to a condensation (internal or external) environment. The Cooling Units Inspection Program will manage the effects of loss of material due to crevice, galvanic, general, pitting, or microbiologically influenced corrosion, a reduction in heat transfer due to fouling of heat exchanger tubes and fins, or cracking of aluminum components. The Cooling Units Inspection Program will comprise baseline inspections prior to the period of extended operation followed by opportunistic inspections, when components are opened for maintenance, repair, or surveillance to ensure that the existing environmental conditions in cooling units are not causing material degradation that could result in a loss of component intended function during the period of extended operation.

Insert B into page B-66

The Cooling Units Inspection Program is a new condition-monitoring program. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

Insert C into page B-66

The Cooling Units Inspection Program is a new plant-specific Columbia program for License Renewal. NUREG-1801 includes an Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (XI.M38) that is focused on steel components and the loss of material aging effect. Rather than necessitating enhancements and exceptions to the NUREG-1801 program, a plant-specific program is credited.

The Cooling Units Inspection Program is a new plant-specific program that is evaluated against the ten elements described in Appendix A of the Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, NUREG-1800, Revision 1. The results of an evaluation for each element are provided below.

Insert D into page B-66

Prior to the period of extended operation, the Cooling Units Inspection Program identifies conditions relative to the following subject mechanical components to determine whether, and to what extent, degradation is occurring and to provide a baseline for future inspections. The plant systems/components in the scope of the Cooling Units Inspection Program include:

- Diesel Building Mixed Air (DMA) – drain pan, drain piping
- Pumphouse Mixed Air (PMA) and Pumphouse Return Air (PRA) – drain pan, drain piping
- Radwaste Building Mixed Air (WMA) – unit housing, drain pan, heat exchanger (fins), heat exchanger (tubes), piping
- Reactor Building Return Air (RRA) – drain pan, piping, valve body

The program manages the following aging effects of subject components:

- Loss of material due to crevice, pitting, and galvanic corrosion and reduction in heat transfer due to fouling of copper alloy heat exchanger tubes exposed to condensation.
- Loss of material due to crevice, pitting, galvanic, and general corrosion and MIC for steel components exposed to condensation.

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~~The Cooling Units Inspection focuses on a representative sample population of subject components at susceptible locations to be defined in the implementing documents. The inspections identify symptomatic evidence of cracking, loss of material, or reduction in heat transfer at other susceptible locations within the scope of the inspection due to the similarities in materials and environmental conditions.~~

Replace with Insert B on page B-67a

- Preventive Actions

~~No actions are taken as part of the Cooling Units Inspection to prevent aging effects or to mitigate aging degradation.~~

include

- Parameters Monitored or Inspected

The parameters to be inspected by the Cooling Units Inspection ~~are~~ wall thickness or visual evidence of degradation, as measures of loss of material and cracking, and visual evidence of fouling as a measure of reduction in heat transfer. ~~Inspections will be performed by qualified personnel using established NDE techniques.~~

Insert C on page B-67a

- Detection of Aging Effects

~~The Cooling Units Inspection will use a combination of established volumetric (radiographic testing or ultrasonic testing) and visual (VT-1 or VT-3 or equivalent) examination techniques performed by qualified personnel on a sample population of subject components determined by engineering evaluation, to identify evidence of cracking (of aluminum), a loss of material, or fouling, or to confirm a lack thereof.~~

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~~The sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operation, and the lowest design margins.~~

~~The Cooling Units Inspection will be conducted within the 10 year period prior to the period of extended operation.~~

- Monitoring and Trending

~~This one time inspection activity is used to characterize conditions and determine if, and to what extent, further actions may be required. The activity includes provisions for increasing the inspection sample size and location if degradation is detected.~~

Replace with Insert E on page B-67b

for baseline inspections

The sample size will be determined by engineering evaluation of the materials of construction, the environment (i.e., service conditions), aging effects, and operating

Insert A into page B-67

The baseline inspection portion of Cooling Units Inspection Program focuses on a representative sample population of subject components at susceptible locations to be defined in the implementing documents. The inspections identify symptomatic evidence of cracking, loss of material, or reduction in heat transfer at other susceptible locations within the scope of the inspection due to the similarities in materials and environmental conditions. Subsequent inspections are opportunistic when components are opened for periodic maintenance, repair, and surveillance activities when surfaces are made available for inspection.

Insert B into page B-67

The Cooling Units Inspection Program does not include any actions to prevent aging effects or to mitigate aging degradation. It is a condition monitoring program.

Insert C into page B-67

Inspections will be performed by qualified personnel using the appropriate established nondestructive examination (NDE) techniques, primarily visual, with enhanced visual, surface, or volumetric techniques used depending on the aging effect.

Insert D into page B-67

The Cooling Units Inspection Program provides for detection of aging effects prior to a loss of component intended function. Inspections will include a combination of established visual or enhanced visual (e.g., VT-1 or VT-3 or equivalent), volumetric (e.g., radiographic testing or ultrasonic testing), and surface examination techniques performed by qualified personnel.

Baseline inspections will be established on a sample population of subject components determined by engineering evaluation to identify evidence of cracking (of aluminum), a loss of material, or fouling, prior to the period of extended operation. Opportunistic inspections will be conducted, thereafter, when components are opened for maintenance, repair, or surveillance and surfaces are made available for inspection.

For baseline inspections, the sample population will be 20% of the total population for each material - environment - aging effect group, up to a maximum of 25 inspections per group and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operation, and the lowest design margins.

Inspection of the sample population will be conducted within the 10-year period prior to the period of extended operation, and will serve as a baseline for future inspections. Any evidence of degradation that could lead to a loss of component intended function will be documented and evaluated through the Columbia corrective action program, including provisions for increasing the inspection sample size and locations.

Insert E into page B-67

The Cooling Units Inspection Program comprises baseline inspections prior to the period of extended operation and opportunistic inspections when components are opened for maintenance, repair, and surveillance thereafter. Baseline inspections are used to characterize material conditions and include provisions for increasing the inspection sample size and locations if degradation is detected. The results of baseline inspections are considered to ensure that opportunistic inspections thereafter will detect aging prior to a loss of component intended function.

experience (e.g., time in-service, most susceptible locations, lowest design margins). Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action process to determine the need for subsequent aging management activities and for monitoring and trending of the results.

Insert B from page B-68b

program.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.

Replace with Insert C from page B-68b

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

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- Operating Experience
  The Cooling Units Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effects. The inspection provides for confirmation of material conditions near the period of extended operation. The elements comprising the inspection activity are to be consistent with industry practice.

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  A review of Columbia operating experience, documented in recent work orders, revealed that cooling unit coils have been found clean and no leakage was observed.

Add Insert A from Page B-68a

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Inspection findings will be documented and evaluated by assigned engineering personnel. The inspection findings will be reviewed to ensure that each material exposed to condensation has been examined via opportunistic inspection within a 5 year time period. If opportunistic inspections have not occurred within the 5-year interval, appropriate actions will be taken to ensure these inspections are performed. Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action program with subsequent adjustments to the program made as necessary.

Insert C into page B-68

Indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria established by engineering evaluation of the pertinent design standard.

Unacceptable inspection findings will include visual evidence of a loss of material or reduction in heat transfer due to fouling, a reduction in wall thickness where appropriate, or evidence of cracking of aluminum obtained by enhanced visual, surface, or volumetric examination.

If the acceptance criteria are not met, then the indications and conditions will be evaluated under the Columbia corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation or prior to the next opportunity for inspection.

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The Cooling Units Inspection Program is a new plant-specific program for which plant operating experience has not shown the occurrence of the aforementioned aging effects. The ~~inspection~~ Program provides for confirmation of material conditions before entering the period of extended operation, and detection of aging effects prior to loss of component intended function during the period of extended operation. The elements comprising the program activities will be consistent with industry practice.

NUREG-1801, Revision 1, is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability, with only general indication that inspection of internal surfaces during the performance of periodic surveillance and maintenance activities has proven effective in maintaining the material condition of plant systems, structures, and components. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

~~The site corrective action program and an ongoing review of industry operating experience will be used to ensure that a one-time inspection activity remains the appropriate method for managing the effects of aging for components within the scope of this activity.~~

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Required Enhancements

Not applicable, this is a new ~~activity~~ program.

Conclusion

Program

provide reasonable assurance that the aging effects will be managed such that

Implementation of the Cooling Units Inspection will ~~verify that there are no aging effects requiring management for the subject components, or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that~~ the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation and that spatial interactions (e.g., leakage) will not result in loss of safety-related component intended functions during the period of extended operation.

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This operating experience supports that baseline inspections of each material, to determine actual material conditions, prior to the period of extended operation and opportunistic inspections thereafter will, in conjunction with the normal operating experience review process, ensure aging is detected prior to a loss of component intended function. The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program is effective in managing the effects of aging for components within the scope of this program during the period of extended operation.

LRA Amendment 21
Diesel Systems Inspection Program
Revised Pages

Letter dated August 26th, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML102300229)

Letter dated September 16th, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML102450727)

Letter dated November 1st, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML102930593)

LRA Page number	LRA Page number	LRA Page number
3.3-20	A-46a	B-77a
3.3-52	A-46b	B-77b
3.3-65	B-3	B-78
3.3-104	B-14	B-78a
A-3	B-18	B-78b
A-13	B-18b	B-79
A-13a	B-20	B-79a
A-46	B-77	B-80

Environments

Subject mechanical components of the Diesel (Engine) Exhaust System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Closed cycle cooling water
- Lubricating oil
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Diesel (Engine) Exhaust System:

- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Diesel (Engine) Exhaust System:

- Bolting Integrity Program
- Closed Cooling Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Diesel Systems Inspection ← Program
- External Surfaces Monitoring Program
- Heat Exchangers Inspection
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection

3.3.2.2.7.2 BWR Reactor Water Cleanup and Shutdown Cooling Systems

Loss of material due to general, pitting, and crevice corrosion for steel piping components, accumulators, tanks, and heat exchanger components exposed to treated water is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components, accumulators, tanks, and heat exchanger components.

The one exception is the Equipment Drains Radioactive System, for which loss of material for piping and piping components with a structural integrity function is managed by the Monitoring and Collection Systems Inspection ~~which is a new one-time inspection that will detect and characterize loss of material.~~ Program.

3.3.2.2.7.3 Diesel Exhaust Piping, Piping Components, and Piping Elements

During normal plant operations, diesel exhaust piping, piping components, and piping elements are exposed to diesel exhaust gases infrequently and for short durations. For the remaining time, these components are exposed internally to outdoor air. The configuration of the diesel exhaust has the potential for collection of moisture inside the piping, piping components, and piping elements. With the combination of this potential for moisture collection and the infrequent exposure to diesel exhaust gases, loss of material due to crevice, general and pitting corrosion is an aging effect requiring management for steel (exhaust) piping exposed internally to outdoor air. This loss of material is managed by the Diesel Systems Inspection or the Diesel-Driven Fire Pumps Inspection Program, ~~which are new one-time inspections that will detect and characterize loss of material on the internal surface of diesel exhaust piping, piping components, and piping elements.~~

3.3.2.2.8 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion (MIC)

Loss of material due to general, pitting, and crevice corrosion and microbiologically-influenced corrosion (MIC) for steel piping components, and the steel diesel fuel oil storage tank, with coatings buried in soil is managed by the Buried Piping and Tanks Inspection Program.

3.3.2.2.9 Loss of Material due to General, Pitting, Crevice, Microbiologically Influenced Corrosion, and Fouling

3.3.2.2.9.1 Piping, Piping Components, and Piping Elements – Fuel Oil

Loss of material due to general, pitting, and crevice corrosion and MIC for steel piping components and tanks exposed to fuel oil is managed by the Fuel Oil Chemistry Program. The Fuel Oil Chemistry Program manages aging effects through periodic

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-18	Stainless steel and steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust	Loss of material/ general (steel only), pitting and crevice corrosion	A plant specific aging management program is to be evaluated.	Yes, plant specific	Steel diesel engine exhaust piping, piping components, and piping elements were evaluated as being exposed to diesel exhaust infrequently, and for short durations, and to outdoor air the remainder of the time. The Diesel Systems Inspection or the Diesel-Driven Fire Pumps Inspection is credited. A Note E is applied. Refer to Section 3.3.2.2.7.3 for further information.

Program

Program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-76	Steel piping, piping components, and piping elements (without lining/coating or with degraded lining/coating) exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining/coating degradation	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Except as noted below, the Open-Cycle Cooling Water Program is credited to manage loss of material for steel piping, piping components, and piping elements that are exposed to raw water. For steel piping and piping components in the other auxiliary systems that are exposed to raw water, the following programs are credited to manage loss of material: • Diesel Starting Air Inspection for drain piping in Diesel Starting Air System • Diesel Systems Inspection for drain piping in the Diesel (Engine) Exhaust System • Monitoring and Collection Systems Inspection for ~~drain piping~~ in Equipment Drains Radioactive, Floor Drain, and Floor Drain Radioactive systems

Program

Program

Replace deleted text with: "drain piping and tanks"

APPENDIX A
TABLE OF CONTENTS

A.1.2.15 CRDRL Nozzle Program

The CRDRL Nozzle Program is an existing mitigation and condition monitoring program that manages cracking due to flaw growth of the control rod drive return line (CRDRL) nozzle, safe end, cap, and connecting welds. The CRDRL Nozzle Program consists of a) mitigation activities, and b) inspection, flaw evaluation, and repair in accordance with the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWB, Table IWB 2500-1 (2001 Edition through 2003 Addenda) and the recommendations of NUREG-0619. System modifications were implemented by the original equipment manufacturer prior to initial startup to mitigate cracking. The BWR Water Chemistry Program monitors and controls reactor coolant water chemistry in accordance with BWRVIP guidelines to ensure the long-term integrity and safe operation of the critical regions of the CRDRL nozzle.

The CRDRL Nozzle Program credits portions of the Inservice Inspection (ISI) Program.

A.1.2.16 Diesel Starting Air Inspection

The Diesel Starting Air Inspection detects and characterizes the condition of materials for the DSA System air dryers and downstream piping and components (excluding the DSA System air receivers). The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred.

The Diesel Starting Air Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.17 Diesel Systems Inspection

Program

Replace with Insert A on page A-13a

~~The Diesel Systems Inspection detects and characterizes the condition of materials for the interior of the exhaust piping for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust System, including the loop seal drains from the exhaust piping, and the drain pans and drain piping associated with air handling units of the Diesel Building HVAC systems. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred.~~

~~or cracking due to stress corrosion cracking~~

~~The Diesel Systems Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.~~

A.1.2.18 Diesel-Driven Fire Pumps Inspection

Program

Replace with Insert B on page A-13a

~~The Diesel Driven Fire Pumps Inspection detects and characterizes the material condition of the interior of the Fire Protection System diesel engine exhaust piping, and of Fire Protection System diesel heat exchangers exposed to a raw water environment.~~

Insert A into page A-13

The Diesel Systems Inspection Program manages the effects of loss of material due to corrosion and cracking due to stress corrosion cracking of materials for the interior of the steel and stainless steel exhaust piping components for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust System, including the loop seal drains from the exhaust piping.

The Diesel Systems Inspection Program is a new program that will be implemented via baseline inspection of a sample population followed by opportunistic inspections when components are opened for periodic maintenance, repair, or surveillance activities when surfaces are made available for inspection. These inspections ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

Insert B into page A-13

The Diesel-Driven Fire Pumps Inspection Program manages the effects of loss of material, due to corrosion or erosion, and reduction in heat transfer of the interior of the Fire Protection System diesel engine exhaust piping, and of Fire Protection System diesel heat exchangers exposed to a raw water environment. The program also manages cracking due to SCC of susceptible materials.

The Diesel-Driven Fire Pumps Inspection Program is a new program that will be implemented via baseline inspection of a sample population followed by opportunistic inspections when components are opened for periodic maintenance, repair, and surveillance activities when surfaces are made available for inspection. These inspections ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
16) Diesel Starting Air Inspection	The Diesel Starting Air Inspection is a new activity. The Diesel Starting Air Inspection detects and characterizes the condition of materials for the DSA System air dryers and downstream piping and components (excluding the DSA System air receivers). The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.16	Within the 10-year period prior to the period of extended operation.
17) Diesel Systems Inspection Program	~~The Diesel Systems Inspection is a new activity.~~ ~~The Diesel Systems Inspection detects and characterizes the condition of materials for the interior of the exhaust piping for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust System, including the loop seal drains from the exhaust piping, and the drain pans and drain piping associated with air handling units of the Diesel Building HVAC systems. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.~~	A.1.2.17 Replace with Insert A on page A-46a	~~Within the 10-year period prior to the period of extended operation.~~ Replace with Insert C on page A-46b
18) Diesel-Driven Fire Pumps Inspection Program	~~The Diesel-Driven Fire Pumps Inspection is a new activity.~~ ~~The Diesel-Driven Fire Pumps Inspection detects and characterizes the material condition of the interior of the Fire Protection System diesel engine exhaust piping, and of Fire Protection System diesel heat exchangers exposed to a raw water environment. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.~~	A.1.2.18 Replace with Insert B on page A-46a	~~Within the 10-year period prior to the period of extended operation.~~

Insert A into page A-46

The Diesel Systems Inspection Program is a new program.

The Diesel Systems Inspection Program manages the effects of loss of material due to corrosion and cracking due to stress corrosion cracking of materials for the interior of the steel and stainless steel exhaust piping components for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust System, including the loop seal drains from the exhaust piping.

The Diesel Systems Inspection Program consists of baseline inspections prior to the period of extended operation followed by opportunistic inspections during the period of extended operation.

Following the baseline inspection, inspection findings will be reviewed periodically to ensure that each material exposed to air-outdoor and raw water has been examined via opportunistic inspection or action are taken to ensure inspections are performed. Initial interval for review of inspection findings is 5 years and may be adjusted based on operating experience.

Insert B into page A-46

The Diesel-Driven Fire Pumps Inspection Program is a new program.

The Diesel-Driven Fire Pumps Inspection Program manages the effects of loss of material, due to corrosion or erosion, and reduction in heat transfer of the interior of the Fire Protection System diesel engine exhaust piping, and of Fire Protection System diesel heat exchangers exposed to a raw water environment. The program also manages cracking due to SCC of susceptible materials.

The Diesel-Driven Fire Pumps Inspection Program consists of baseline inspections prior to the period of extended operation followed by opportunistic inspections during the period of extended operation.

Following the baseline inspection, inspection findings will be reviewed periodically to ensure that each material exposed to air-outdoor and raw water has been examined via opportunistic inspection or action are taken to ensure inspections are performed. Initial interval for review of inspection findings is 5 years and may be adjusted based on operating experience.

Insert C into page A-46

Implementation prior to the period of extended operation and initial inspection within the 10-year period prior to the period of extended operation. Then ongoing.

APPENDIX B
TABLE OF CONTENTS

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program See Section B.2.46.
XI.M32	One-Time Inspection	Chemistry Program Effectiveness Inspection See Section B.2.12. ~~Cooling Units Inspection~~ ~~See Section B.2.14.~~ ~~Diesel Driven Fire Pumps Inspection~~ ~~See Section B.2.18.~~ Diesel Starting Air Inspection See Section B.2.16. ~~Diesel Systems Inspection~~ ~~See Section B.2.17.~~ ~~Flexible Connection Inspection~~ ~~See Section B.2.27.~~ Heat Exchangers Inspection See Section B.2.30. Lubricating Oil Inspection See Section B.2.37. ~~Monitoring and Collection Systems Inspection~~ ~~See Section B.2.41.~~ ~~Service Air System Inspection~~ ~~See Section B.2.48.~~ Supplemental Piping/Tank Inspection See Section B.2.51.
XI.M33	Selective Leaching of Materials	Selective Leaching Inspection See Section B.2.47.
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program See Section B.2.5.
XI.M35	One-time Inspection of ASME Code Class 1 Small-Bore Piping	~~Small Bore Class 1 Piping Inspection~~ See Section B.2.49.
XI.M36	External Surfaces Monitoring	External Surfaces Monitoring Program See Section B.2.23.

Insert A from Page B-14a

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	High-Voltage Porcelain Insulators Aging Management Program See Section B.2.31.
N/A	Plant-Specific Program	Potable Water Monitoring Program See Section B.2.43.
N/A	Plant-Specific Program	Preventive Maintenance – RCIC Turbine Casing See Section B.2.44.

Insert A from Page B-18a

Insert A from page B-18b after page B-18a from Amendment 2

Insert B from Page B-18b for Amendment 21

~~Amendment 14~~ Amendment 21

~~Amendment 2~~

Insert A to Page B-18

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	Service Level 1 Protective Coatings Program See Section B.2.55.

Insert B to Page B-18

N/A	Plant-Specific Program	Cooling Units Inspection Program See Section B.2.14.
N/A	Plant-Specific Program	Diesel Systems Inspection Program See Section B.2.17.
N/A	Plant-Specific Program	Diesel-Driven Fire Pumps Inspection Program See Section B.2.18.
N/A	Plant-Specific Program	Flexible Connection Inspection Program See Section B.2.27.
N/A	Plant-Specific Program	Monitoring and Collection Systems Inspection Program See Section B.2.41.
N/A	Plant-Specific Program	Service Air System Inspection Program See Section B.2.48.

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801
(continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
BWR Vessel Internals Program Section B.2.10	Existing	Yes	--	--	--
BWR Water Chemistry Program Section B.2.11	Existing	Yes	--	--	--
Chemistry Program Effectiveness Inspection Section B.2.12	New	Yes	--	--	--
Closed Cooling Water Chemistry Program Section B.2.13	Existing	--	Yes	--	Yes
Cooling Units Inspection Program Section B.2.14	New	~~Yes~~	--	Yes	--
CRDRL Nozzle Program Section B.2.15	Existing	Yes	--	--	--
Diesel Starting Air Inspection Section B.2.16	New	Yes	--	--	--
Diesel Systems Inspection Program Section B.2.17	New	~~Yes~~	--	Yes	--
Diesel-Driven Fire Pumps Inspection Program Section B.2.18	New	~~Yes~~	--	Yes	--

B.2.17 Diesel Systems Inspection ← Program

Program Description

components

The Diesel Systems Inspection is a new one-time inspection that will detect and characterize the material condition of the interior of the exhaust piping for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust System, including the loop seal drains from the exhaust piping, and the drain pans and drain piping associated with air handling units of the Diesel Building HVAC systems. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred or is likely to occur.

or cracking due to stress corrosion cracking

Implementation of the Diesel Systems Inspection will provide confirmation that the integrity of the subject components will be maintained consistent with the current licensing basis during the period of extended operation.

Replace with Insert A on page B-77a

NUREG-1801 Consistency

The Diesel Systems Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, "One-Time Inspection."

Replace with Insert B on page B-77a

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

components

and stainless steel

- Scope of Program

The scope of the Diesel Systems Inspection includes the steel exhaust piping exposed to an air outdoor environment, and the loop seal drains from the exhaust piping that are exposed to a raw water environment, for the following diesel engines:

  - DG-ENG-1A1/1A2
  - DG-ENG-1B1/1B2
  - DG-ENG-1C
  - DSA-ENG-C/2C

Replace with Insert C on page B-77b

Additionally the stainless steel drain pans and steel drain piping exposed to a raw water environment and associated with the following equipment are in the scope of the Diesel Systems Inspection:

Replace with Insert D on page B-77b

Insert A into page B-77

The Diesel Systems Inspection Program is a new plant-specific program for Columbia. The program will consist of inspections of the steel and stainless steel exhaust piping components for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust (DE) System, including the loop seal drains from the exhaust piping. The Diesel Systems Inspection Program will manage the effects of loss of material due to corrosion and cracking of stainless steel components. The Diesel Systems Inspection Program will comprise baseline inspections prior to the period of extended operation followed by opportunistic inspections when components are opened for maintenance, repair, or surveillance to ensure that the existing environmental conditions in subject components are not causing material degradation that could result in a loss of component intended function during the period of extended operation.

Implementation of this program will ensure that the integrity of the subject components will be maintained consistent with the current licensing basis during the period of extended operation.

The Diesel Systems Inspection Program is a new condition-monitoring program. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

Insert B into page B-77

The Diesel Systems Inspection Program is a new plant-specific Columbia program for License Renewal. NUREG-1801 includes an Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (XI.M38) that is focused on steel components and the loss of material aging effect. Rather than necessitating enhancements and exceptions to the NUREG-1801 program, a plant-specific program is credited.

The Diesel Systems Inspection Program is a new plant-specific program that is evaluated against the ten elements described in Appendix A of the Standard Review Plan of License Renewal Applications for Nuclear Power Plants, NUREG-1800, Revision 1. The results of an evaluation for each element are provided below.

Insert C into page B-77

Prior to the period of extended operation, the Diesel Systems Inspection Program includes baseline inspection of a sample population followed by opportunistic inspection of the steel and stainless steel exhaust piping components exposed to an air-outdoor environment, and the loop seal drains from the exhaust piping that are exposed to raw water environment, for the following diesel engines:

Insert D into page B-77

The baseline inspection portion of the Diesel Systems Inspection Program focuses on a representative sample population of subject components at susceptible locations to be defined in the implementing documents. The inspections identify symptomatic evidence of loss of material or cracking at other susceptible locations within the scope of the inspection due to the similarities in materials and environmental conditions. Subsequent inspections are opportunistic when components are opened for periodic maintenance, repair, and surveillance activities when surfaces are made available for inspection.

- DMA-AH-11, 12, 21, 22, 31, 32, and 51 (air-handling unit housings)

Replace with Insert A on page B-78a

- Preventive Actions

No actions are taken as part of the Diesel Systems Inspection to prevent aging effects or to mitigate aging degradation.

Replace with Insert B on page B-78a

- Parameters Monitored or Inspected

The parameters to be inspected by the Diesel Systems Inspection include wall thickness or visual evidence of internal surface degradation, of the diesel exhaust piping and the drain pans and drain piping as measures of loss of material. Inspections will be performed by qualified personnel using established NDE techniques (i.e., ultrasonic examination). Visual inspection of the internals for evidence of corrosion and corrosion products may be performed as opportunities for access arise.

and cracking

cracking;

Replace with Insert C on page B-78a

- Detection of Aging Effects

The Diesel Systems Inspection will use a combination of established volumetric and visual examination techniques (such as equivalent to VT-1 or VT-3) performed by qualified personnel on a representative sample of the subject components to identify evidence of loss of material

or cracking

The sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and design margins.

The Diesel Systems Inspection will be conducted after the issuance of the renewed license and prior to the end of the current operating license, with sufficient time to implement programmatic oversight for the period of extended operation. The activities will be conducted no earlier than 10 years prior to the end of the current operating license, so that conditions are more representative of the conditions expected during the period of extended operation.

- Monitoring and Trending

This one-time inspection activity is used to characterize conditions and to determine if, and to what extent, further actions may be required. The activity includes provisions for increasing the inspection sample size and locations if degradation is detected.

Replace with Insert D on page B-78b

The sample size will be determined by engineering evaluation of the materials of construction, the environment (i.e., service conditions), aging effects, and operating experience (e.g., time in service, susceptible locations, lowest design margins). Inspection findings that do not meet the acceptance criteria will be evaluated using

Insert A into page B-78

The Diesel Systems Inspection Program does not include any actions to prevent aging effects or to mitigate aging degradation. This program is a condition monitoring program.

Insert B into page B-78

The parameters to be inspected by the Diesel Systems Inspection Program include wall thickness or visual evidence of internal surface degradation of the diesel exhaust piping as measures of loss of material and cracking.

Inspections will be performed by qualified personnel using the appropriate established nondestructive examination (NDE) techniques, primarily visual, with enhanced visual, surface, or volumetric techniques used depending on the aging effect.

Insert C into page B-78

The Diesel Systems Inspection Program provides for detection of aging effects prior to a loss of component intended function. Inspections will include a combination of established visual or enhanced visual (e.g., VT-1 or VT-3 or equivalent), volumetric (e.g., radiographic testing or ultrasonic testing), and surface examination techniques performed by qualified personnel.

Baseline inspections will be established on a sample population of subject components determined by engineering evaluation to identify evidence of loss of material or cracking prior to the period of extended operation. Opportunistic inspections will be conducted, thereafter, when components are opened for periodic maintenance, repair, or surveillance activities and surfaces are made available for inspection.

For baseline inspections, the sample population will be 20% of the total population for each material – environment – aging effect group, up to a maximum of 25 inspections per group and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operation, and the lowest design margins.

Inspection of the sample population will be conducted within the 10-year period prior to the period of extended operation, and will serve as a baseline for future inspections. Any evidence of degradation that could lead to a loss of component intended function will be documented and evaluated through the Columbia corrective action program, including provisions for increasing the inspection sample size and locations.

Insert D into page B-78

The Diesel Systems Inspection Program comprises baseline inspections prior to the period of extended operation and opportunistic inspections when components are opened for maintenance, repair, or surveillance thereafter. Baseline inspections are used to characterize material conditions and include provisions for increasing the inspection sample size and locations if degradation is detected. The results of baseline inspections are considered to ensure that opportunistic inspections thereafter will detect aging prior to a loss of component intended function.

The sample size for baseline inspections will be determined by engineering evaluation of the materials of construction, the environment (i.e., service conditions), aging effects, and of operating experience (e.g., time in-service, most susceptible locations, lowest design margins, etc.). Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action program.

Inspection findings will be documented and evaluated by assigned engineering personnel. The inspection findings will be reviewed to ensure that each material exposed to air-outdoor and raw water has been examined via opportunistic inspections within a 5 year time period. If opportunistic inspections have not occurred within the 5-year interval, appropriate actions will be taken to ensure these inspections are performed. Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action program with subsequent adjustments to the program made as necessary.

~~acceptance criteria~~

~~the Columbia corrective action process to determine the need for subsequent aging management activities and for further monitoring and trending of the results.~~

- Acceptance Criteria
  ~~Indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria. Inspection results will be compared against minimum wall thickness values established in accordance with design requirements or engineering evaluation. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.~~

  Replace with Insert A on page B-79a

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience

  Replace with Insert B on page B-79a

  ~~mechanisms are~~

  ~~effects~~

  ~~The Diesel Systems Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effect. The activity provides confirmation of conditions where degradation is not expected, has not evidenced as a problem, or where the aging mechanism is slow acting. The inspection provides for confirmation of material conditions near the period of extended operation. The elements comprising the inspection activity are to be consistent with industry practice.~~

  ~~NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.~~

  ~~A review of Columbia operating experience to date has found no indications of loss of material in the subject diesel system components. The site corrective action~~

  ~~or cracking~~

Insert A into page B-79

Indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria established by engineering evaluation of the pertinent design standard.

Unacceptable inspection findings will include visual evidence of loss of material or cracking, or a reduction in wall thickness where appropriate, obtained by enhanced visual, surface, or volumetric examination.

If the acceptance criteria are not met, then the indications and conditions will be evaluated under the Columbia corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation or prior to the next opportunity for inspection.

Insert B into page B-79

The Diesel Systems Inspection Program is a new plant-specific program for which plant operating experience has not shown the occurrence of the aforementioned aging effect. The program provides for confirmation of material conditions before entering the period of extended operation, and detection of aging effects prior to loss of component intended function during the period of extended operation. The elements comprising the program activities will be consistent with industry practice.

Recent industry operating experience has been reviewed for applicability with only general indication that inspection of internal surfaces during the performance of periodic surveillance and maintenance activities has proven effective in maintaining the material condition of plant systems, structures, and components. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

A review of Columbia operating experience to date has found no indications of loss of material or cracking in the subject diesel system components. This operating experience supports that baseline inspections of each material, to determine actual material conditions, prior to the period of extended operation and opportunistic inspections thereafter will, in conjunction with the normal operating experience review process, ensure aging is detected prior to a loss of component intended function. The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program is effective in managing the effects of aging for components within the scope of this program during the period of extended operation.

~~program and an ongoing review of industry operating experience will be used to ensure that a one time inspection activity remains the appropriate method for managing the effects of aging for components within the scope of this activity.~~

Required Enhancements

program

Not applicable, this is a new ~~activity~~.

Conclusion

Program

provide reasonable assurance that the aging effects will be managed such that

Implementation of the Diesel Systems Inspection will ~~verify that there are no aging effects requiring management for the subject components or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that~~ the intended functions of the subject components will be maintained consistent with the current licensing basis during the period of extended operation.

LRA Amendment 21
Diesel-Driven Fire Pumps Inspection Program
Revised Pages

Letter dated August 26th, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML102300229)

Letter dated September 16th, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML102450727)

Letter dated November 1st, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML102930593)

LRA Page number	LRA Page number	LRA Page number
3.3-27	A-13a	B-81
3.3-52	A-14	B-81a
3.3-65	A-46	B-81b
3.3-99	A-46a	B-82
3.3-100	A-46b	B-82a
3.3-108	B-3	B-82b
3.3-110	B-14	B-83
3.3-111	B-18	B-83a
A-3	B-18b	B-84
A-13	B-20	

Environments

Subject mechanical components of the FP System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Gas
- Fuel oil
- Lubricating oil
- Moist air
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the FP System:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of pre-load
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the FP System:

- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- Chemistry Program Effectiveness Inspection
- Diesel-Driven Fire Pumps Inspection
- Program
- External Surfaces Monitoring Program
- Fire Protection Program
- Fire Water Program
- Flexible Connection Inspection
- Program

3.3.2.2.7.2 BWR Reactor Water Cleanup and Shutdown Cooling Systems

Loss of material due to general, pitting, and crevice corrosion for steel piping components, accumulators, tanks, and heat exchanger components exposed to treated water is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components, accumulators, tanks, and heat exchanger components.

The one exception is the Equipment Drains Radioactive System, for which loss of material for piping and piping components with a structural integrity function is managed by the Monitoring and Collection Systems Inspection ~~which is a new one-time inspection that will detect and characterize loss of material.~~ Program.

3.3.2.2.7.3 Diesel Exhaust Piping, Piping Components, and Piping Elements

During normal plant operations, diesel exhaust piping, piping components, and piping elements are exposed to diesel exhaust gases infrequently and for short durations. For the remaining time, these components are exposed internally to outdoor air. The configuration of the diesel exhaust has the potential for collection of moisture inside the piping, piping components, and piping elements. With the combination of this potential for moisture collection and the infrequent exposure to diesel exhaust gases, loss of material due to crevice, general and pitting corrosion is an aging effect requiring management for steel (exhaust) piping exposed internally to outdoor air. This loss of material is managed by the Diesel Systems Inspection or the Diesel-Driven Fire Pumps Inspection Program, ~~which are new one-time inspections that will detect and characterize loss of material on the internal surface of diesel exhaust piping, piping components, and piping elements.~~

3.3.2.2.8 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion (MIC)

Loss of material due to general, pitting, and crevice corrosion and microbiologically-influenced corrosion (MIC) for steel piping components, and the steel diesel fuel oil storage tank, with coatings buried in soil is managed by the Buried Piping and Tanks Inspection Program.

3.3.2.2.9 Loss of Material due to General, Pitting, Crevice, Microbiologically Influenced Corrosion, and Fouling

3.3.2.2.9.1 Piping, Piping Components, and Piping Elements – Fuel Oil

Loss of material due to general, pitting, and crevice corrosion and MIC for steel piping components and tanks exposed to fuel oil is managed by the Fuel Oil Chemistry Program. The Fuel Oil Chemistry Program manages aging effects through periodic

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-18	Stainless steel and steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust	Loss of material/ general (steel only), pitting and crevice corrosion	A plant specific aging management program is to be evaluated.	Yes, plant specific	Steel diesel engine exhaust piping, piping components, and piping elements were evaluated as being exposed to diesel exhaust infrequently, and for short durations, and to outdoor air the remainder of the time. The Diesel Systems Inspection or the Diesel-Driven Fire Pumps Inspection is credited. A Note E is applied. Refer to Section 3.3.2.2.7.3 for further information.

Program

Program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-68	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801. Except as noted below, the Fire Water Program is credited to manage loss of material for steel piping and piping components in the auxiliary systems that are exposed to raw water. This item is also applied to heat exchanger components that are exposed to raw water in the Fire Protection System, for which the Diesel-Driven Fire Pumps Inspection is credited. A Note E is applied. For steel piping and piping components that are exposed to raw water in the Fuel Pool Cooling, Plant Sanitary Drains, and Reactor Closed Cooling Water systems, the Monitoring and Collection Systems Inspection is credited; in the Potable Cold Water System the Potable Water Monitoring Program is credited. A Note E is applied.

Program

Program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-69	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801. The Fire Water Program is credited to manage loss of material for stainless steel piping, piping components, and piping elements in the Fire Protection System that are exposed to raw water.
3.3.1-70	Copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801. The Fire Water Program is credited to manage loss of material for copper alloy piping, piping components, and piping elements in the Fire Protection System that are exposed to raw water. This item is also applied to copper alloy heat exchanger components in the Fire Protection System that are exposed to raw water. For these components, the Diesel-Driven Fire Pumps Inspection is credited. A Note E is applied.

Program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-80	Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically *influenced* corrosion	Open-Cycle Cooling Water System Add: "and piping components that are"	No	Consistent with NUREG-1801, with exceptions. Except as noted below, the *Open-Cycle Cooling Water* Program is credited to manage loss of material for stainless steel and copper alloy heat exchanger components in the auxiliary systems that are exposed to raw water. A Note D is applied. For stainless steel piping ~~that is~~ exposed to raw (drainage) water in the Diesel Starting Air System, the Diesel Starting Air Inspection is credited. A Note E is applied. For stainless steel heat exchanger tubes that are exposed to raw water in the Fire Protection System, the Diesel-Driven Fire Pumps Inspection is credited. A Note E is applied.

Program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-82	Copper alloy heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Except as noted below, the Open-Cycle Cooling Water Program is credited to manage loss of material for copper alloy heat exchanger components in the auxiliary systems that are exposed to raw water. The Diesel Driven Fire Pumps Inspection is credited to manage loss of material for copper alloy heat exchanger components in the Fire Protection System that are exposed to raw water. A Note E is applied.

Program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-83	Stainless steel and copper alloy heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Except as noted below, the Open-Cycle Cooling Water Program is credited to manage reduction in heat transfer for stainless steel and copper alloy heat exchanger tubes in the auxiliary systems that are exposed to raw water. The Diesel-Driven Fire Pumps Inspection is credited to ~~detect and characterize~~ reduction in heat transfer for stainless steel and copper alloy heat exchanger tubes in the Fire Protection System that are exposed to raw water. A Note E is applied.

Program

manage

APPENDIX A
TABLE OF CONTENTS

A.1.2.15 CRDRL Nozzle Program

The CRDRL Nozzle Program is an existing mitigation and condition monitoring program that manages cracking due to flaw growth of the control rod drive return line (CRDRL) nozzle, safe end, cap, and connecting welds. The CRDRL Nozzle Program consists of a) mitigation activities, and b) inspection, flaw evaluation, and repair in accordance with the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWB, Table IWB 2500-1 (2001 Edition through 2003 Addenda) and the recommendations of NUREG-0619. System modifications were implemented by the original equipment manufacturer prior to initial startup to mitigate cracking. The BWR Water Chemistry Program monitors and controls reactor coolant water chemistry in accordance with BWRVIP guidelines to ensure the long-term integrity and safe operation of the critical regions of the CRDRL nozzle.

The CRDRL Nozzle Program credits portions of the Inservice Inspection (ISI) Program.

A.1.2.16 Diesel Starting Air Inspection

The Diesel Starting Air Inspection detects and characterizes the condition of materials for the DSA System air dryers and downstream piping and components (excluding the DSA System air receivers). The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred.

The Diesel Starting Air Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.17 Diesel Systems Inspection

Program

Replace with Insert A on page A-13a

~~The Diesel Systems Inspection detects and characterizes the condition of materials for the interior of the exhaust piping for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust System, including the loop seal drains from the exhaust piping, and the drain pans and drain piping associated with air-handling units of the Diesel Building HVAC systems. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred.~~

~~or cracking due to stress corrosion cracking~~

~~The Diesel Systems Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.~~

A.1.2.18 Diesel-Driven Fire Pumps Inspection

Program

Replace with Insert B on page A-13a

~~The Diesel Driven Fire Pumps Inspection detects and characterizes the material condition of the interior of the Fire Protection System diesel engine exhaust piping, and of Fire Protection System diesel heat exchangers exposed to a raw water environment.~~

Insert A into page A-13

The Diesel Systems Inspection Program manages the effects of loss of material due to corrosion and cracking due to stress corrosion cracking of materials for the interior of the steel and stainless steel exhaust piping components for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust System, including the loop seal drains from the exhaust piping.

The Diesel Systems Inspection Program is a new program that will be implemented via baseline inspection of a sample population followed by opportunistic inspections when components are opened for periodic maintenance, repair, or surveillance activities when surfaces are made available for inspection. These inspections ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

Insert B into page A-13

The Diesel-Driven Fire Pumps Inspection Program manages the effects of loss of material, due to corrosion or erosion, and reduction in heat transfer of the interior of the Fire Protection System diesel engine exhaust piping, and of Fire Protection System diesel heat exchangers exposed to a raw water environment. The program also manages cracking due to SCC of susceptible materials.

The Diesel-Driven Fire Pumps Inspection Program is a new program that will be implemented via baseline inspection of a sample population followed by opportunistic inspections when components are opened for periodic maintenance, repair, and surveillance activities when surfaces are made available for inspection. These inspections ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

~~The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion or erosion, or a reduction in heat transfer due to fouling has occurred. The inspection also determines whether cracking due to SCC of susceptible materials has occurred.~~

~~The Diesel-Driven Fire Pumps Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.~~

A.1.2.19 Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program is an inspection program that detects degradation of electrical cables and connections that are not environmentally qualified and are within the scope of license renewal. The program provides for periodic visual inspection of accessible, non-environmentally qualified cables and connections in order to determine if age-related degradation is occurring, particularly in plant areas with adverse localized environments. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified design or bounding plant environment for the general area.

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program is a new aging management program that will be implemented prior to the period of extended operation. The inspection frequency of the program will be once every 10 years, with the initial inspection to be performed prior to the period of extended operation.

A.1.2.20 Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program is a monitoring program that detects degradation of electrical cables and connections that are not environmentally qualified and used in circuits with sensitive, low-current applications (such as radiation monitoring and nuclear instrumentation loops). The program provides for a review of calibration records for the low-current instruments, in order to detect and identify degradation of the cable system insulation resistance. The program retains the option to perform direct cable testing.

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits Program is a new aging management program that will be implemented prior to the period of extended operation. The frequency of the program will be once every 10 years, with the initial review to be performed prior to the period of extended operation.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
16) Diesel Starting Air Inspection	The Diesel Starting Air Inspection is a new activity. The Diesel Starting Air Inspection detects and characterizes the condition of materials for the DSA System air dryers and downstream piping and components (excluding the DSA System air receivers). The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.16	Within the 10-year period prior to the period of extended operation.
17) Diesel Systems Inspection Program	~~The Diesel Systems Inspection is a new activity.~~ ~~The Diesel Systems Inspection detects and characterizes the condition of materials for the interior of the exhaust piping for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust System, including the loop seal drains from the exhaust piping, and the drain pans and drain piping associated with air handling units of the Diesel Building HVAC systems. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.~~	A.1.2.17 Replace with Insert A on page A-46a	~~Within the 10-year period prior to the period of extended operation.~~ Replace with Insert C on page A-46b
18) Diesel-Driven Fire Pumps Inspection Program	~~The Diesel-Driven Fire Pumps Inspection is a new activity.~~ ~~The Diesel-Driven Fire Pumps Inspection detects and characterizes the material condition of the interior of the Fire Protection System diesel engine exhaust piping, and of Fire Protection System diesel heat exchangers exposed to a raw water environment. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.~~	A.1.2.18 Replace with Insert B on page A-46a	~~Within the 10-year period prior to the period of extended operation.~~

Insert A into page A-46

The Diesel Systems Inspection Program is a new program.

The Diesel Systems Inspection Program manages the effects of loss of material due to corrosion and cracking due to stress corrosion cracking of materials for the interior of the steel and stainless steel exhaust piping components for the Division 1, 2, and 3 diesels in the Diesel Engine Exhaust System, including the loop seal drains from the exhaust piping.

The Diesel Systems Inspection Program consists of baseline inspections prior to the period of extended operation followed by opportunistic inspections during the period of extended operation.

Following the baseline inspection, inspection findings will be reviewed periodically to ensure that each material exposed to air-outdoor and raw water has been examined via opportunistic inspection or action are taken to ensure inspections are performed. Initial interval for review of inspection findings is 5 years and may be adjusted based on operating experience.

Insert B into page A-46

The Diesel-Driven Fire Pumps Inspection Program is a new program.

The Diesel-Driven Fire Pumps Inspection Program manages the effects of loss of material, due to corrosion or erosion, and reduction in heat transfer of the interior of the Fire Protection System diesel engine exhaust piping, and of Fire Protection System diesel heat exchangers exposed to a raw water environment. The program also manages cracking due to SCC of susceptible materials.

The Diesel-Driven Fire Pumps Inspection Program consists of baseline inspections prior to the period of extended operation followed by opportunistic inspections during the period of extended operation.

Following the baseline inspection, inspection findings will be reviewed periodically to ensure that each material exposed to air-outdoor and raw water has been examined via opportunistic inspection or action are taken to ensure inspections are performed. Initial interval for review of inspection findings is 5 years and may be adjusted based on operating experience.

Insert C into page A-46

Implementation prior to the period of extended operation and initial inspection within the 10-year period prior to the period of extended operation. Then ongoing.

APPENDIX B
TABLE OF CONTENTS

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program See Section B.2.46.
XI.M32	One-Time Inspection	Chemistry Program Effectiveness Inspection See Section B.2.12. ~~Cooling Units Inspection~~ ~~See Section B.2.14.~~ ~~Diesel Driven Fire Pumps Inspection~~ ~~See Section B.2.18.~~ Diesel Starting Air Inspection See Section B.2.16. ~~Diesel Systems Inspection~~ ~~See Section B.2.17.~~ ~~Flexible Connection Inspection~~ ~~See Section B.2.27.~~ Heat Exchangers Inspection See Section B.2.30. Lubricating Oil Inspection See Section B.2.37. ~~Monitoring and Collection Systems Inspection~~ ~~See Section B.2.41.~~ ~~Service Air System Inspection~~ ~~See Section B.2.48.~~ Supplemental Piping/Tank Inspection See Section B.2.51.
XI.M33	Selective Leaching of Materials	Selective Leaching Inspection See Section B.2.47.
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program See Section B.2.5.
XI.M35	One-time Inspection of ASME Code Class 1 Small-Bore Piping	~~Small Bore Class 1 Piping Inspection~~ See Section B.2.49.
XI.M36	External Surfaces Monitoring	External Surfaces Monitoring Program See Section B.2.23.

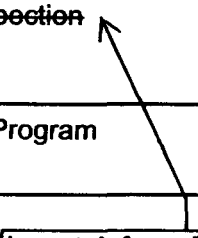
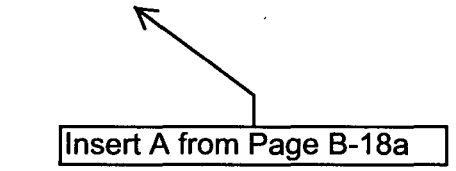
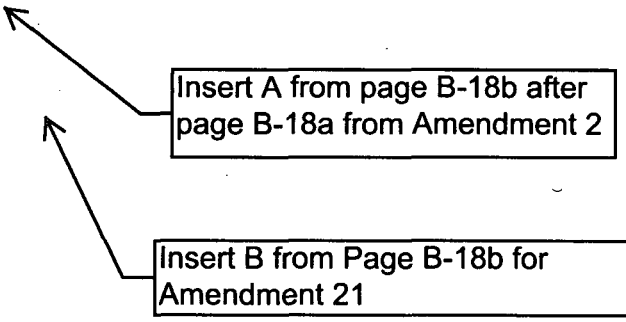


Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	High-Voltage Porcelain Insulators Aging Management Program See Section B.2.31.
N/A	Plant-Specific Program	Potable Water Monitoring Program See Section B.2.43.
N/A	Plant-Specific Program	Preventive Maintenance – RCIC Turbine Casing See Section B.2.44.





~~Amendment 14~~ Amendment 21

~~Amendment 2~~

Insert A to Page B-18

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	Service Level 1 Protective Coatings Program See Section B.2.55.

Insert B to Page B-18

N/A	Plant-Specific Program	Cooling Units Inspection Program See Section B.2.14.
N/A	Plant-Specific Program	Diesel Systems Inspection Program See Section B.2.17.
N/A	Plant-Specific Program	Diesel-Driven Fire Pumps Inspection Program See Section B.2.18.
N/A	Plant-Specific Program	Flexible Connection Inspection Program See Section B.2.27.
N/A	Plant-Specific Program	Monitoring and Collection Systems Inspection Program See Section B.2.41.
N/A	Plant-Specific Program	Service Air System Inspection Program See Section B.2.48.

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801
(continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
BWR Vessel Internals Program Section B.2.10	Existing	Yes	--	--	--
BWR Water Chemistry Program Section B.2.11	Existing	Yes	--	--	--
Chemistry Program Effectiveness Inspection Section B.2.12	New	Yes	--	--	--
Closed Cooling Water Chemistry Program Section B.2.13	Existing	--	Yes	--	Yes
Cooling Units Inspection Program Section B.2.14	New	~~Yes~~	--	Yes	--
CRDRL Nozzle Program Section B.2.15	Existing	Yes	--	--	--
Diesel Starting Air Inspection Section B.2.16	New	Yes	--	--	--
Diesel Systems Inspection Program Section B.2.17	New	~~Yes~~	--	Yes	--
Diesel-Driven Fire Pumps Inspection Program Section B.2.18	New	~~Yes~~	--	Yes	--

B.2.18 Diesel-Driven Fire Pumps Inspection

Program

Program Description

Replace with Insert A on page B-81a

~~The Diesel-Driven Fire Pumps Inspection is a new one-time inspection that will detect and characterize the material condition of the interior of the Fire Protection System diesel engine exhaust piping, and of Fire Protection System diesel heat exchangers exposed to a raw water (antifreeze) environment. The inspection provides direct evidence as to whether, and to what extent, a loss of material or reduction in heat transfer has occurred or is likely to occur that could result in a loss of intended function. The inspection also determines whether cracking due to stress corrosion cracking of susceptible materials has occurred. Implementation of the Diesel-Driven Fire Pumps Inspection will ensure that the pressure boundary, structural integrity, and heat transfer capability of susceptible components is maintained consistent with the current licensing basis during the period of extended operation.~~

NUREG-1801 Consistency

Replace with Insert B on page B-81a

~~The Diesel-Driven Fire Pumps Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, "One-Time Inspection."~~

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program

Replace with Insert C on page B-81b

~~The scope of the Diesel-Driven Fire Pumps Inspection includes the steel exhaust lines that are exposed to an air-outdoor environment and copper alloy, copper alloy >15% Zn, gray cast iron, and stainless steel heat exchanger components exposed to a raw water (antifreeze) environment for the following diesels:~~

  - FP-ENG-1
  - FP-ENG-110

Add Insert D on page B-81b

Program does not include any actions

- Preventive Actions

The

~~No actions are taken as part of the~~ Diesel-Driven Fire Pumps Inspection to prevent aging effects or to mitigate aging degradation.

This program is a condition monitoring program.

Insert A into page B-81

The Diesel-Driven Fire Pumps Inspection Program is a new plant-specific program for Columbia. The program will consist of inspections of the interior of the Fire Protection (FP) System diesel engine exhaust piping, and of FP System diesel heat exchangers exposed to a raw water (antifreeze or fire water) environment. The Diesel-Driven Fire Pumps Inspection Program will manage the effects of loss of material and reduction in heat transfer. The program also manages cracking due to stress corrosion cracking of susceptible materials. The Diesel-Driven Fire Pumps Inspection Program will comprise baseline inspections prior to the period of extended operation followed by opportunistic inspections, when components are opened for maintenance, repair, or surveillance to ensure that the existing environmental conditions in subject components are not causing material degradation that could result in a loss of component intended function during the period of extended operation.

Implementation of this program will ensure that the pressure boundary and heat transfer capability of susceptible components is maintained consistent with the current licensing basis during the period of extended operation.

The Diesel-Driven Fire Pumps Inspection Program is a new condition-monitoring program. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

Insert B into page B-81

The Diesel-Driven Fire Pumps Inspection Program is a new plant-specific Columbia program for License Renewal. NUREG-1801 includes an Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (XI.M38) that is focused on steel components and the loss of material aging effect. Rather than necessitating enhancements and exceptions to the NUREG-1801 program, a plant-specific program is credited.

The Diesel-Driven Fire Pumps Inspection Program is a new plant-specific program that is evaluated against the ten elements described in Appendix A of the Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, NUREG-1800, Revision 1. The results of an evaluation for each element are provided below.

Insert C into page B-81

Prior to the period of extended operation, the Diesel-Driven Fire Pumps Inspection Program includes a baseline inspection of a sample population followed by opportunistic inspection of the steel exhaust lines that are exposed to an air-outdoor environment and copper alloy, copper alloy > 15% Zn, gray cast iron, and stainless steel heat exchanger components exposed to a raw water (antifreeze or fire water) environment for the following diesels:

Insert D into page B-81

The baseline inspection portion of Diesel-Driven Fire Pumps Inspection Program focuses on a representative sample population of subject components at susceptible locations to be defined in the implementing documents. The inspections identify symptomatic evidence of cracking, loss of material, or reduction in heat transfer at other susceptible locations within the scope of the inspection due to the similarities in materials and environmental conditions. Subsequent inspections are opportunistic when components are opened for periodic maintenance, repair, and surveillance activities when surfaces are made available for inspection.

- Parameters Monitored or Inspected

Replace with Insert A on page B-82a

The parameters to be inspected by the Diesel-Driven Fire Pumps Inspection include wall thickness or visual evidence of internal surface degradation, of the diesel exhaust piping and heat exchangers as measures of cracking, loss of material, or reduction in heat transfer. Inspections will be performed by qualified personnel using established NDE techniques (i.e., ultrasonic examination). Visual inspection of the internal surfaces for evidence of corrosion, corrosion products, or fouling may be performed.

- Detection of Aging Effects

Replace with Insert B on page B-82a

The Diesel-Driven Fire Pumps Inspection will use a combination of established volumetric and visual examination techniques (such as equivalent to VT-1 or VT-3) performed by qualified personnel on the subject components to identify evidence of loss of material due to corrosion or erosion. In addition, the inspection will determine whether cracking due to stress corrosion cracking of copper alloy >=15% Zn or reduction in heat transfer due to fouling of copper alloy and stainless steel heat exchanger tubes exposed to a raw water (antifreeze) environment is occurring.

The inspection locations will be determined by engineering evaluation and, where practical, focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and lowest design margins.

The Diesel-Driven Fire Pumps Inspection activities will be conducted within the 10-year period prior to the period of extended operation.

- Monitoring and Trending

Replace with Insert C on page B-82b

This one-time inspection activity is used to characterize conditions and to determine if, and to what extent, further actions may be required. The activity includes provisions for increasing the number of inspection locations if degradation is detected.

There are two components in the scope of the inspection (FP-ENG-1 and FP-ENG-110). The inspection locations include the exhaust lines and heat exchanger parts associated with those components. The inspection locations will be determined by engineering evaluation. Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action process to determine the need for subsequent aging management activities and for further monitoring and trending of the results.

- Acceptance Criteria

Replace with Insert D on page B-82b

Indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective

Insert A into page B-82

The parameters to be inspected by the Diesel-Driven Fire Pumps Inspection Program include wall thickness or visual evidence of internal surface degradation, of the diesel exhaust piping and heat exchangers as measures of cracking, loss of material, or reduction in heat transfer.

Inspections will be performed by qualified personnel using the appropriate established nondestructive examination (NDE) techniques, primarily visual, with enhanced visual, surface, or volumetric techniques used depending on the aging effect.

Insert B into page B-82

The Diesel-Driven Fire Pumps Inspection Program provides for detection of aging effects prior to a loss of component intended function. Inspections will include a combination of established visual or enhanced visual (e.g., VT-1 or VT-3 or equivalent), volumetric (e.g., radiographic testing or ultrasonic testing), and surface examination techniques performed by qualified personnel.

Baseline inspections will be established on a sample population of subject components determined by engineering evaluation to identify evidence of cracking, loss of material, or fouling, prior to the period of extended operation. Opportunistic inspections will be conducted, thereafter, when components are opened for maintenance, repair, or surveillance and surfaces are made available for inspection.

For baseline inspections, the sample population will be 20% of the total population for each material – environment – aging effect group, up to a maximum of 25 inspections per group and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operation, and the lowest design margins.

Inspection of the sample population will be conducted within the 10 year period prior to the period of extended operation, and will serve as a baseline for future inspections. Any evidence of degradation that could lead to a loss of component intended function will be documented and evaluated through the Columbia corrective action program, including provisions for increasing the inspection sample size and locations.

Insert C into page B-82

The Diesel-Driven Fire Pumps Inspection Program comprises inspections prior to the period of extended operation and opportunistic inspections when components are opened for maintenance, repair, and surveillance thereafter. Baseline inspections are used to characterize material conditions and include provisions for increasing the inspection sample size and locations if degradation is detected. The results of baseline inspections are considered to ensure that opportunistic inspections thereafter will detect aging prior to a loss of component intended function.

The sample size for baseline inspections will be determined by engineering evaluation of the materials of construction, the environment (i.e., service conditions), aging effects, and of operating experience (e.g., time in-service, most susceptible locations, lowest design margins, etc.). Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action program.

Inspection findings will be documented and evaluated by assigned engineering personnel. The inspection findings will be reviewed to ensure that each material exposed to air-outdoor and raw water has been examined via opportunistic inspections within a 5 year time period. If opportunistic inspections have not occurred within the 5 year interval, appropriate actions will be taken to ensure these inspections are performed. Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action program with subsequent adjustments to the program made as necessary.

Insert D into page B-82

Indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria established by engineering evaluation of the pertinent design standard.

Unacceptable inspection findings will include visual evidence of cracking, loss of material, reduction in heat transfer due to fouling, or a reduction in wall thickness where appropriate, obtained by enhanced visual, surface, or volumetric examination.

If the acceptance criteria are not met, then the indications and conditions will be evaluated under the Columbia corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation or prior to the next opportunity for inspection.

action program to determine whether they could result in a loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Diesel-Driven Fire Pumps Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effects. The activity provides confirmation of conditions where degradation is not expected, has not been observed, or where the aging mechanism is slow acting. The elements comprising the inspection activity are to be consistent with industry practice.

  Replace with Insert A on page B-83a

  NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

  A review of Columbia operating experience reveals past issues associated with the subject components, including a loose clamp, a small oil leak, discolored oil, and a damaged connection pipe. None of these issues are age related, nor do they involve the subject exhaust piping or heat exchanger components.

  The site corrective action program and an ongoing review of industry operating experience will be used to ensure that a one-time inspection activity remains the appropriate method for managing the effects of aging for components within the scope of this activity.

Required Enhancements

Not applicable, this is a new activity. → program

Insert A into page B-83

The Diesel-Driven Fire Pumps Inspection Program is a new plant-specific program for which plant operating experience has not shown the occurrence of the aforementioned aging effects. The program provides confirmation of material conditions before entering the period of extended operation, and detection of aging effects prior to loss of component intended function during the period of extended operation. The elements comprising the program activities will be consistent with industry practice.

Recent industry operating experience has been reviewed for applicability; with only general indication that inspection of internal surfaces during the performance of periodic surveillance and maintenance activities has proven effective in maintaining the material condition of plant systems, structures, and components. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

A review of Columbia operating experience reveals past issues associated with the subject components, including a loose clamp, a small oil leak, discolored oil, and a damaged connection pipe. None of these issues are age-related, nor do they involve the subject exhaust piping or heat exchanger components.

This operating experience supports that baseline inspections of each material, to determine actual material conditions, prior to the period of extended operation and opportunistic inspections thereafter will, in conjunction with the normal operating experience review process, ensure aging is detected prior to a loss of component intended function. The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program is effective in managing the effects of aging for components within the scope of this program during the period of extended operation.

Conclusion

Program

Implementation of the Diesel-Driven Fire Pumps Inspection will ~~verify that there are no aging effects requiring management for the subject components or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that~~ the component intended functions of the subject components will be maintained consistent with the current licensing basis during the period of extended operation.

provide reasonable assurance that the aging effects will be managed such that

LRA Amendment 21
Flexible Connections Inspection Program
Revised Pages

Letter dated October 20th, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML102730355)

LRA Page number	LRA Page number	LRA Page number
3.2-7	3.3-182	B-4
3.2-9	3.3-182a	B-14
3.2-17	3.3-306	B-18
3.3-8	3.3-310	B-18b
3.3-18	3.3-310a	B-22
3.3-19	3.3-318	B-101
3.3-27	3.3-328	B-102
3.3-39	3.3-328b	B-103
3.3-41	3.3-332	B-115
3.3-42	3.3.340	B-115a
3.3-51	3.3.340b	B-115b
3.3-51b	3.3.400a	B-116
3.3-56	A-4	B-116a
3.3-60	A-17	B-116b
3.3-61	A-17a	B-117
3.3-78	A-49	B-117a
3.3-78a	A-52	B-118
3.3-180	A-52a	

3.2.2.1.5 Standby Gas Treatment (SGT) System

Materials

The materials of construction for subject mechanical components of the SGT System are:

- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the SGT System are exposed to the following normal operating environments:

- Air-indoor uncontrolled

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of SGT System:

- Hardening and loss of strength
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the SGT System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Flexible Connection Inspection ← Program

3.2.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

For the Engineered Safety Features Systems, those items requiring further evaluation are addressed in the following sections.

due to crevice and pitting corrosion through examination of stainless steel and copper alloy piping components.

Copper alloys with less than 15% zinc and less than 8% aluminum are not susceptible to loss of material due to pitting or crevice corrosion and thus have no aging effect requiring management.

3.2.2.2.3.5 Partially Encased Tanks – Raw Water

As stated in Table 3.2.1, there are no tanks at Columbia that compare to item number 3.2.1-07. The ESF systems contain no outdoor stainless steel tanks. Therefore, no further evaluation is necessary.

3.2.2.2.3.6 Piping, Piping Components, Piping Elements, and Tanks – Internal Condensation

This item is applied to external condensation on stainless steel valve bodies in the RHR System. The resulting loss of material is managed by the External Surfaces Monitoring Program, which consists of observation and surveillance activities to detect age-related degradation.

3.2.2.2.4 Reduction of Heat Transfer due to Fouling

3.2.2.2.4.1 Heat Exchanger Tubes – Lubricating Oil

Reduction of heat transfer for stainless steel and copper alloy heat exchanger tubes exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage reduction of heat transfer through examination of stainless steel and copper alloy heat exchanger tubes.

3.2.2.2.4.2 Heat Exchanger Tubes – Treated Water

Reduction of heat transfer due to fouling for stainless steel heat exchanger tubes exposed to treated water in ESF systems is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants to minimize fouling. The Heat Exchangers Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage reduction of heat transfer due to fouling through examination of stainless steel heat exchanger tubes.

3.2.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

Elastomer flexible connections subject to hardening and loss of strength are managed by the Flexible Connection Inspection, ~~which is a new one-time inspection to detect and characterize aging of these connections.~~ Program

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-11	Elastomer seals and components in standby gas treatment system exposed to air - indoor uncontrolled	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes, plant-specific	Consistent with NUREG-1801, with exceptions. Elastomer flexible connections subject to hardening and loss of strength are managed by the Flexible Connection Inspection Program, ~~which is a new one-time inspection to detect and characterize aging of these connections~~. Refer to Section 3.2.2.2.5 for further information.
3.2.1-12	PWR Only				
3.2.1-13	Steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled (internal)	Loss of material due to general corrosion and fouling	A plant-specific aging management program is to be evaluated.	Yes, plant-specific	Not applicable. The nozzles used in the containment spray systems for Columbia are formed of brass (drywell) and stainless steel (suppression chamber (wetwell)). The flow orifices are stainless steel. Refer to Section 3.2.2.2.7 for further information.

3.3.2.1.4 Containment Exhaust Purge and Containment Supply Purge Systems

Materials

The materials of construction for the subject mechanical components of the Containment Exhaust Purge and Containment Supply Purge Systems are:

- Copper alloy > 15% Zn
- Elastomer
- Stainless steel
- Steel

Environments

The subject mechanical components of the Containment Exhaust Purge and Containment Supply Purge Systems are exposed to the following normal plant environments:

- Air-indoor uncontrolled
- Dried air
- Gas

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Exhaust Purge and Containment Supply Purge Systems:

- Hardening and loss of strength
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Containment Exhaust Purge and Containment Supply Purge Systems:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Flexible Connection Inspection ← Program

- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Diesel Building HVAC systems:

- Bolting Integrity Program
- Cooling Units Inspection ← Program
- External Surfaces Monitoring Program
- Open-Cycle Cooling Water Program

Add bullet for:
Flexible Connection Inspection Program

3.3.2.1.15 Diesel Cooling Water System

Materials

The materials of construction for subject mechanical components of the Diesel Cooling Water System are:

- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Glass
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Diesel Cooling Water System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Lubricating oil
- Moist air
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Diesel Cooling Water System:

- Hardening and loss of strength
- Loss of material
- Loss of pre-load
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Diesel Cooling Water System:

- Bolting Integrity Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Flexible Connection Inspection ← Program
- Heat Exchangers Inspection
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection
- Open-Cycle Cooling Water Program
- Supplemental Piping/Tank Inspection

3.3.2.1.16 Diesel (Engine) Exhaust System

Materials

The materials of construction for subject mechanical components of the Diesel (Engine) Exhaust System are:

- Copper alloy
- Elastomer
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the FP System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Gas
- Fuel oil
- Lubricating oil
- Moist air
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the FP System:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of pre-load
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the FP System:

- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- Chemistry Program Effectiveness Inspection
- Diesel-Driven Fire Pumps Inspection ← Program
- External Surfaces Monitoring Program
- Fire Protection Program
- Fire Water Program
- Flexible Connection Inspection ← Program

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Pump House HVAC systems:

- Bolting Integrity Program
- Cooling Units Inspection ← Program
- External Surfaces Monitoring Program
- Open-Cycle Cooling Water Program

← Add bullet for: Flexible Connection Inspection Program

3.3.2.1.35 Radwaste Building Chilled Water System

Materials

The materials of construction for subject mechanical components of the Radwaste Building Chilled Water System are:

- Copper alloy
- Copper alloy > 15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Radwaste Building Chilled Water System are exposed to the following normal operating environments:

- Closed cycle cooling water
- Condensation

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Radwaste Building Chilled Water System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Radwaste Building HVAC systems:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Radwaste Building HVAC systems:

- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- Cooling Units Inspection ← Program
- External Surfaces Monitoring Program
- Heat Exchangers Inspection ← Add bullet for: Flexible Connection Inspection Program
- Open-Cycle Cooling Water Program
- Selective Leaching Inspection

3.3.2.1.37 Reactor Building HVAC Systems

Materials

The materials of construction for subject mechanical components of the Reactor Building HVAC systems are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Gray cast iron

- Stainless steel
- Steel

Environments

Subject mechanical components of the Reactor Building HVAC systems are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Condensation
- Moist air
- Raw water
- Steam

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Reactor Building HVAC systems:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of pre-load
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Reactor Building HVAC systems:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Cooling Units Inspection ← Program
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion (FAC) Program ← Add bullet for: Flexible Connection Inspection Program
- Open-Cycle Cooling Water Program

stainless steel diesel engine exhaust components. ~~In addition~~, with the exception of the flexible connection for the HPCS diesel compressor, diesel exhaust piping, piping components, and piping elements are steel, for which cracking due to SCC is not an applicable aging effect.

3.3.2.2.4 Cracking due to Stress Corrosion Cracking and Cyclic Loading

The associated items in Table 3.3.1 (including 3.3.2.2.4.1, 3.3.2.2.4.2, 3.3.2.2.4.3, and 3.3.2.2.4.4) are applicable to PWRs only.

3.3.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

3.3.2.2.5.1 Components of Heating and Ventilation Systems

The HVAC systems contain elastomer flexible connections and elastomer mechanical sealants requiring aging management based on plant operating experience. Elastomer flexible connections ~~and elastomer mechanical sealants~~ subject to hardening and loss of strength in HVAC systems are managed by the ~~External Surfaces Monitoring Program~~. Replace with Insert B on page 3.3-51b

3.3.2.2.5.2 Spent Fuel Cooling and Cleanup Systems

There are no elastomer linings in the Fuel Pool Cooling System that are subject to AMR.

Elastomer flexible connections in the Diesel Cooling Water System refer to Table 3.3.1 item 3.3.1-12. Hardening and loss of strength of these flexible connections is managed by the Flexible Connection Inspection ~~which is a new one-time inspection to detect and characterize aging of these connections~~. Program

3.3.2.2.6 Reduction of Neutron-Absorbing Capacity and Loss of Material due to General Corrosion

The spent fuel racks contain a neutron-absorbing medium of boron carbide (B_4C) granular material bonded together to form plates. These plates are sealed in a stainless steel rack and are not exposed to treated water. Consequently, there are no aging effects requiring management for the neutron absorber material. The stainless steel around the neutron absorber is exposed to treated water and is susceptible to loss of material due to crevice and pitting corrosion. The BWR Water Chemistry Program is credited for aging management. Insert A from Page 3.3-51a

3.3.2.2.7 Loss of Material due to General, Pitting, and Crevice Corrosion

3.3.2.2.7.1 Reactor Coolant Pump Oil Collection System

Columbia does not have a reactor coolant pump (reactor recirculation pump) oil collection system. Other components exposed to lubricating oil have loss of material mitigated by the Lubricating Oil Analysis Program with the Lubricating Oil Inspection verifying the effectiveness of the program.

Insert B into page 3.3-51

Flexible Connection Inspection Program. Elastomer mechanical sealants subject to hardening and loss of strength in HVAC systems are managed by the External Surfaces Monitoring Program.

With the exception of the flexible connections in the HVAC systems, w

Lubricating Oil Analysis Program to manage loss of material due to pitting and crevice corrosion and MIC through examination of stainless steel piping and heat exchanger components.

3.3.2.2.13 Loss of Material due to Wear

~~W~~ear of elastomer seals and components exposed to air was not identified as an aging effect requiring management. Loss of material due to wear is the result of relative motion between two surfaces in contact. However, wear occurs during the performance of an active function; as a result of improper design, application, or operation; or to a very small degree with insignificant consequences. Therefore, loss of material due to wear is not an aging effect requiring management for elastomers exposed to air-indoor uncontrolled

except for the flexible connections in the HVAC systems,

The flexible connections in the HVAC systems are managed by the Flexible Connection Inspection Program.

3.3.2.2.14 Loss of Material due to Cladding Breach

The associated items in Table 3.3.1 are applicable to PWRs only.

3.3.2.2.15 Quality Assurance for Aging Management of Non-safety Related Components

Quality Assurance provisions applicable to license renewal are discussed in Appendix B, Section B.1.3.

3.3.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the components of the Auxiliary Systems. The section of the application that contains the time-limited aging analysis review results is indicated in parentheses.

- Metal Fatigue (Section 4.3, Metal Fatigue)

3.3.3 Conclusions

The Auxiliary System components and commodities having aging effects requiring management have been evaluated, and aging management programs have been selected to manage the aging effects. A description of the aging management programs is provided in Appendix B, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging will be adequately managed so that there is reasonable assurance that the intended functions of Auxiliary System components and commodities will be maintained consistent with the current licensing basis, and that spatial interactions will not result in the loss of any safety-related intended functions, during the period of extended operation.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-11	Elastomer seals and components exposed to air – indoor uncontrolled (internal/external)	Hardening and loss of strength due to elastomer degradation	A plant specific aging management program is to be evaluated.	Yes, plant specific flexible connections	Consistent with NUREG-1801. The Flexible Connection Inspection ~~is credited to detect and characterize~~ hardening and loss of strength for elastomers ~~in the auxiliary systems, except for HVAC systems.~~ For HVAC system elastomers (~~flexible connections and~~ mechanical sealants), the External Surfaces Monitoring Program is credited. During normal plant operations, elastomer components in the Diesel (Engine) Exhaust System and the Diesel Lubricating Oil System are not exposed to high temperatures, radiation or ozone; therefore, no aging effects were identified as requiring management for the air – indoor uncontrolled environment. For these cases, a Note I is applied. Refer to Section 3.3.2.2.5.1 for further information.

manage

Program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-12	Elastomer lining exposed to treated water or treated borated water	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Although there is no elastomer lining exposed to treated water or treated borated water, this item is applied to flexible connections in the Diesel Cooling Water System. The Flexible Connection Inspection is credited to ~~detect and characterize~~ hardening and loss of strength for these elastomer components. Refer to Section 3.3.2.2.5.2 for further information.
3.3.1-13	Boral, boron steel spent fuel storage racks neutron-absorbing sheets exposed to treated water or treated borated water	Reduction of neutron-absorbing capacity and loss of material due to general corrosion	A plant specific aging management program is to be evaluated.	Yes, plant specific	~~Not applicable.~~ The spent fuel storage racks contain a neutron-absorbing medium of boron carbide (B_4C) granular material bonded together to form plates. These plates are sealed in a stainless steel rack and are not exposed to ~~treated water.~~ Refer to Section 3.3.2.2.6 for further information.

Replace with "Consistent with NUREG-1801."

manage

Program

Add "The Boron Carbide Monitoring Program is credited. A Note E is applied."

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-33	Stainless steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The Lubricating Oil Analysis Program, in conjunction with the Lubricating Oil Inspection, is credited to manage loss of material for stainless steel piping, piping components, and piping elements in the auxiliary systems that are exposed to lubricating oil. This item is also applied to heat exchanger components that are exposed to lubricating oil. A Note C is applied. Refer to Section 3.3.2.2.12.2 for further information.
3.3.1-34	Elastomer seals and components exposed to air – indoor uncontrolled (internal or external)	Loss of material due to wear	A plant specific aging management program is to be evaluated.	Yes, plant specific	~~Not applicable.~~ ~~Loss of material due to wear was not identified as an aging effect requiring management for elastomer seals and components in auxiliary systems exposed to air indoor uncontrolled.~~ Refer to Section 3.3.2.2.13 for further information.

Replace with Insert A on page 3.3-78a

Insert A into Page 3.3-78

Consistent with NUREG-1801.

The Flexible Connection Inspection Program is credited to manage loss of material due to wear for elastomer flexible connections in the HVAC systems.

Table 3.3.2-14 Aging Management Review Results – Diesel Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
18	Fan Housing (DEA-FN-11, 12, 21, 22, 31, 32 & 52)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302
19	Fan Housing (DEA-FN-11, 12, 21, 22, 31, 32 & 52)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
20	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	~~External Surfaces Monitoring~~	VII.F4-6	3.3.1-11	E
21	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	~~External Surfaces Monitoring~~	VII.F4-6	3.3.1-11	E
22	Heat Exchanger (header) (DMA-CC-11, 12, 21, 22, 31 & 32)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B
23	Heat Exchanger (header) (DMA-CC-11, 12, 21, 22, 31 & 32)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
~~24~~	~~Heat Exchanger (fins) (DMA-CC-11, 12, 21, 22, 31 & 32)~~	~~Heat transfer~~	~~Aluminum~~	~~Condensation (External)~~	~~Cracking~~	~~Open-Cycle Cooling Water~~	~~N/A~~	~~N/A~~	~~H~~

Flexible Connection Inspection

Flexible Connection Inspection

Delete row 24

Table 3.3.2-14 Aging Management Review Results – Diesel Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
31	Mechanical Sealants	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
32	Mechanical Sealants	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
33	Piping	Structural integrity	Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.G-23	3.3.1-71	E
34	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
35	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
36	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
37	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
38	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G

Insert new rows 39 through 40 for Table 3.3.2-14 as shown on page 3.3-182a

Table 3.3.2-14 Aging Management Review Results – Diesel Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
39	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Loss of material	Flexible Connection Inspection	VII.F4-5	3.3.1-34	E 0329
40	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Loss of material	Flexible Connection Inspection	VII.F4-4	3.3.1-34	E 0329

Table 3.3.2-34 Aging Management Review Results – Pump House HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
26	Fan Housing (POA-FN-2A)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
27	Fan Housing (POA-FN-2A)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
28	Fan Housing (PEA-FN-81A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
29	Fan Housing (PEA-FN-81A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
30	Filter Housing (PRA-FL-1A/B & 2A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
31	Filter Housing (PRA-FL-1A/B & 2A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
32	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	~~External Surfaces Monitoring~~	VII.F2-7	3.3.1-11	E
33	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	~~External Surfaces Monitoring~~	VII.F2-7	3.3.1-11	E

Flexible Connection Inspection

Flexible Connection Inspection

Table 3.3.2-34 Aging Management Review Results – Pump House HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
54	Piping	Structural integrity	Steel	Condensation (Internal)	Loss of material	Cooling Units Inspection	VII.G-23	3.3.1-71	E
55	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
56	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
57	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
58	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	N/A	N/A	G
59	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G

Insert new rows 60 through 61 for Table 3.3.2-34 as shown on page 3.3-310a

Table 3.3.2-34 Aging Management Review Results – Pump House HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
60	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Loss of material	Flexible Connection Inspection	VII.F2-6	3.3.1-34	E 0329
61	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Loss of material	Flexible Connection Inspection	VII.F2-5	3.3.1-34	E 0329

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
26	Fan Housing (WEA-FN-51A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
27	Fan Housing (WEA-FN-52; WEA-FN-53A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
28	Fan Housing (WEA-FN-52; WEA-FN-53A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
29	Filter Housing (WMA-FU-54A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
30	Filter Housing (WMA-FU-54A/B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
31	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	~~External Surfaces Monitoring~~	VII.F1-7	3.3.1-11	E
32	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	~~External Surfaces Monitoring~~	VII.F1-7	3.3.1-11	E

Flexible Connection Inspection

Flexible Connection Inspection

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
92	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
93	Valve Body	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Insert new rows 94 through 99 for Table 3.3.2-36 as shown on page 3.3-328a

Insert new rows 100 through 101 for Table 3.3.2-36 as shown on page 3.3-328b

Table 3.3.2-36 Aging Management Review Results – Radwaste Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
100	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Loss of material	Flexible Connection Inspection	VII.F2-6	3.3.1-34	E 0329
101	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Loss of material	Flexible Connection Inspection	VII.F2-5	3.3.1-34	E 0329

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
26	Fan Cooler Unit Housing (RRA-FC-8, 9 & 21)	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	C 0302
27	Fan Cooler Unit Housing (RRA-FC-8, 9 & 21)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
28	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	~~External Surfaces Monitoring~~	VII.F3-7	3.3.1-11	E
29	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	~~External Surfaces Monitoring~~	VII.F3-7	3.3.1-11	E
30	Flexible Connection	Structural integrity	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	~~External Surfaces Monitoring~~	VII.F3-7	3.3.1-11	E
31	Flexible Connection	Structural integrity	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	~~External Surfaces Monitoring~~	VII.F3-7	3.3.1-11	E
32	Heat Exchanger (housing) (ROA-HC-1 & 2)	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0302

Flexible Connection Inspection

Flexible Connection Inspection

Flexible Connection Inspection

Flexible Connection Inspection

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
80	Valve Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Potable Water Monitoring	VII.C1-19	3.3.1-76	E
81	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	BWR Water Chemistry	N/A	N/A	G
82	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Chemistry Program Effectiveness Inspection	N/A	N/A	G
83	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	G
84	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
85	Valve Body	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Insert new rows 86 and 87 from Page 3.3-340a

Insert new rows 88 through 91 from Page 3.3-340b

Table 3.3.2-37 Aging Management Review Results – Reactor Building HVAC Systems									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
88	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Loss of material	Flexible Connection Inspection	VII.F4-5	3.3.1-34	E 0329
89	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Loss of material	Flexible Connection Inspection	VII.F4-4	3.3.1-34	E 0329
90	Flexible Connection	Structural integrity	Elastomer	Air-indoor uncontrolled (Internal)	Loss of material	Flexible Connection Inspection	VII.F4-5	3.3.1-34	E 0329
91	Flexible Connection	Structural integrity	Elastomer	Air-indoor uncontrolled (External)	Loss of material	Flexible Connection Inspection	VII.F4-4	3.3.1-34	E 0329

Insert A to LRA Page 3.3-400

0325	The material is not aluminum alloy > 12% Zinc or 6% Magnesium, which is required for the mechanism of cracking due to stress corrosion cracking to be applicable.
0326	Based on a review of recent operating experience, the bottom portion of the air-handling unit housings for WMA-AH-51A/B are evaluated as exposed to an internal environment of condensation.
0327	No aging effects requiring management have been identified. However, for all brass (copper alloy > 15% Zn) spray nozzles that are in the scope of license renewal, the Fire Water Program is credited to provide confirmation of the absence of significant aging effects during the period of extended operation.
0328	No aging effects requiring management have been identified. However, the Fire Protection Program is credited to provide confirmation of the absence of significant aging effects for the halon and carbon dioxide suppression systems during the period of extended operation.
0329	Based on plant-specific operating experience, loss of material due to wear is an aging effect requiring management for flexible connections in the HVAC systems. The Flexible Connection Inspection Program is credited for aging management for loss of material due to wear of the subject flexible connections in the HVAC systems.

APPENDIX A
TABLE OF CONTENTS

Program

Power

Program

Program

Program

inspections. The Fire Water Program is a condition monitoring program, comprised of tests and inspections based on NFPA recommendations.

The Fire Water Program is an existing program that requires enhancement prior to the period of extended operation.

Program

Replace with Insert A on page A-17a

A.1.2.27 Flexible Connection Inspection

~~The Flexible Connection Inspection detects and characterizes the material condition of elastomer components exposed to treated water, dried air, gas, and indoor air environments. The inspection provides direct evidence as to whether, and to what extent, hardening and loss of strength has occurred.~~

~~The Flexible Connection Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.~~

A.1.2.28 Flow-Accelerated Corrosion (FAC) Program

The Flow-Accelerated Corrosion (FAC) Program manages loss of material for steel and gray cast iron components located in the treated water environment of systems that are susceptible to FAC, also called erosion-corrosion. The FAC Program combines the elements of predictive analysis, inspections (to baseline and monitor wall-thinning), industry experience, station information gathering and communication, and engineering judgment to monitor and predict FAC wear rates. The program is a condition monitoring program that implements the recommendations of NRC Generic Letter 89-08, and follows the guidance and recommendations of EPRI NSAC-202L [Reference A.1.4-2], to ensure that the integrity of piping systems susceptible to FAC is maintained.

The FAC Program is an existing program that requires enhancement prior to the period of extended operation.

A.1.2.29 Fuel Oil Chemistry Program

The Fuel Oil Chemistry Program is an existing program that maintains fuel oil quality in order to mitigate degradation of the storage tanks and associated components containing fuel oil that are within the scope of license renewal. The program includes diesel fuel oil testing for emergency diesel generator and diesel-driven fire pump fuel. The Fuel Oil Chemistry Program manages the relevant conditions that could lead to the onset and propagation of loss of material due to corrosion, or cracking due to SCC of susceptible copper alloys, through proper monitoring and control of fuel oil contamination consistent with plant technical specifications and American Society for Testing and Materials (ASTM) standards for fuel oil. The relevant conditions are specific contaminants such as water or microbiological organisms in the fuel oil that could lead to corrosion of susceptible materials. Exposure to these contaminants is

Insert A into page A-17

The Flexible Connection Inspection Program manages degradation, including the effects of loss of material due to wear and hardening and loss of strength of elastomer components exposed to treated water, dried air, gas, and indoor air environments.

The Flexible Connection Inspection Program is a new plant-specific program that will be implemented via baseline inspection of a sample population followed by opportunistic inspections, when components are opened for periodic maintenance, repair, or surveillance activities, when surfaces are made available for inspection. These inspections ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
23) External Surfaces Monitoring Program	The External Surfaces Monitoring Program is an existing program that will be continued for the period of extended operation, with the following enhancements: ◦ Add aluminum, copper alloy, copper alloy >15 % Zn, gray cast iron, stainless steel (including CASS), and elastomers to the scope of the program. ◦ Add cracking as an aging effect for aluminum ~~and stainless steel~~ components. ◦ Add visual (VT-1 or equivalent) or volumetric examination techniques to detect cracking. ◦ Add hardening and loss of strength as aging effects for elastomer-based mechanical sealants ~~and flexible connections~~ in HVAC systems. ◦ Add physical examination techniques in addition to visual inspection to detect hardening and loss of strength for elastomer-based mechanical sealants ~~and flexible connections~~ in HVAC systems.	A.1.2.23	Enhancement prior to the period of extended operation. Then ongoing.
24) Fatigue Monitoring Program	The Fatigue Monitoring Program is an existing program that will be continued for the period of extended operation, with the following enhancements:	A.1.2.24 A.1.3.2 A.1.3.4	Enhancement prior to the period of extended operation. Then ongoing.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
27) Flexible Connection Inspection Program	~~The Flexible Connection Inspection is a new activity.~~ ~~The Flexible Connection Inspection detects and characterizes the material condition of elastomer components exposed to treated water, dried air, gas, and indoor air environments. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.~~	A.1.2.27 Replace with Insert A on page A-52a	~~Within the 10-year period prior to the period of extended operation.~~ Replace with Insert B on page A-52a
28) Flow-Accelerated Corrosion (FAC) Program	The Flow-Accelerated Corrosion (FAC) Program is an existing program that will be continued for the period of extended operation, with the following enhancements: • Add the Containment Nitrogen System components supplied with steam from the Auxiliary Steam System to the scope of the program. • Add gray cast iron as a material identified as susceptible to FAC.	A.1.2.28	Enhancement prior to the period of extended operation. Then ongoing.
29) Fuel Oil Chemistry Program	The Fuel Oil Chemistry Program is an existing program that will be continued for the period of extended operation.	A.1.2.29	Ongoing

Insert A into page A-52

The Flexible Connection Inspection Program is a new program.

The Flexible Connection Inspection Program manages degradation, including the effects of loss of material due to wear and hardening and loss of strength of elastomer components exposed to treated water, dried air, gas, and indoor air environments.

The program consists of base line inspections prior to the period of extended operation followed by opportunistic inspections during the period of extended operation.

Following the baseline inspection, inspection findings will be reviewed periodically to ensure that each material and environment combination has been examined via opportunistic inspection or actions are taken to ensure inspections are performed. Initial interval for review of inspection findings is 5 years and may be adjusted based on operating experience.

Insert B into page A-52

Implementation prior to the period of extended operation and initial inspection within the 10-year period prior to the period of extended operation. Then ongoing.

APPENDIX B
TABLE OF CONTENTS

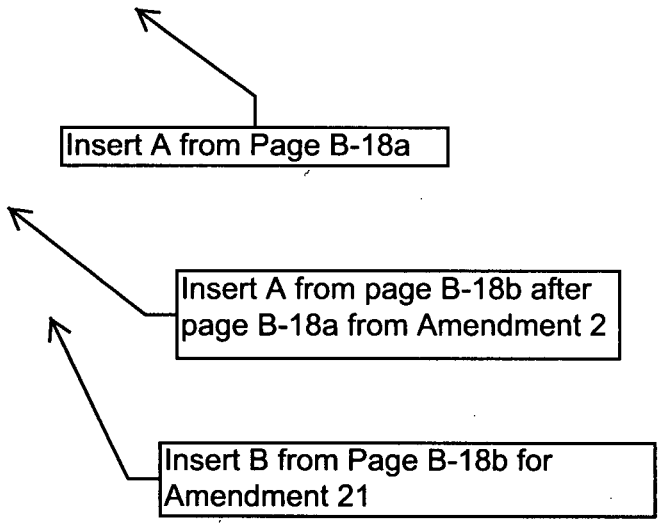
Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program See Section B.2.46.
XI.M32	One-Time Inspection	Chemistry Program Effectiveness Inspection See Section B.2.12. ~~Cooling Units Inspection~~ ~~See Section B.2.14.~~ ~~Diesel Driven Fire Pumps Inspection~~ ~~See Section B.2.18.~~ Diesel Starting Air Inspection See Section B.2.16. ~~Diesel Systems Inspection~~ ~~See Section B.2.17.~~ ~~Flexible Connection Inspection~~ ~~See Section B.2.27.~~ Heat Exchangers Inspection See Section B.2.30. Lubricating Oil Inspection See Section B.2.37. ~~Monitoring and Collection Systems Inspection~~ ~~See Section B.2.41.~~ ~~Service Air System Inspection~~ ~~See Section B.2.48.~~ Supplemental Piping/Tank Inspection See Section B.2.51.
XI.M33	Selective Leaching of Materials	Selective Leaching Inspection See Section B.2.47.
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program See Section B.2.5.
XI.M35	One-time Inspection of ASME Code Class 1 Small-Bore Piping	~~Small Bore Class 1 Piping Inspection~~ See Section B.2.49.
XI.M36	External Surfaces Monitoring	External Surfaces Monitoring Program See Section B.2.23.

Insert A from Page B-14a

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	High-Voltage Porcelain Insulators Aging Management Program See Section B.2.31.
N/A	Plant-Specific Program	Potable Water Monitoring Program See Section B.2.43.
N/A	Plant-Specific Program	Preventive Maintenance – RCIC Turbine Casing See Section B.2.44.



~~Amendment 14~~ Amendment 21
~~Amendment 2~~

Insert A to Page B-18

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	Service Level 1 Protective Coatings Program See Section B.2.55.

Insert B to Page B-18

N/A	Plant-Specific Program	Cooling Units Inspection Program See Section B.2.14.
N/A	Plant-Specific Program	Diesel Systems Inspection Program See Section B.2.17.
N/A	Plant-Specific Program	Diesel-Driven Fire Pumps Inspection Program See Section B.2.18.
N/A	Plant-Specific Program	Flexible Connection Inspection Program See Section B.2.27.
N/A	Plant-Specific Program	Monitoring and Collection Systems Inspection Program See Section B.2.41.
N/A	Plant-Specific Program	Service Air System Inspection Program See Section B.2.48.

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801
(continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Fire Water Program Section B.2.26	Existing	Yes	--	--	Yes
Flexible Connection Inspection Program Section B.2.27	New	--	~~Yes~~	Yes	--
Flow-Accelerated Corrosion (FAC) Program Section B.2.28	Existing	Yes	--	--	Yes
Fuel Oil Chemistry Program Section B.2.29	Existing	--	Yes	--	--
Heat Exchangers Inspection Section B.2.30	New	Yes	--	--	--
High-Voltage Porcelain Insulators Aging Management Program Section B.2.31	Existing	--	--	Yes	--
Inaccessible ~~Medium-Voltage~~ Power Cables Not Subject to 10 CFR 50.49 EQ Requirements Program Section B.2.32	New	Yes	--	--	Yes
Inservice Inspection (ISI) Program Section B.2.33	Existing	Yes	--	--	--
Inservice Inspection (ISI) Program – IWE Section B.2.34	Existing	Yes	--	--	--

B.2.23 External Surfaces Monitoring Program

Program Description

The External Surfaces Monitoring Program will manage the following aging effects for the external surfaces, and in some cases the internal surfaces, of mechanical components within the scope of license renewal:

- Loss of material for metals (aluminum, copper alloy, copper alloy > 15% Zn, gray cast iron, stainless steel (including CASS), and steel) that are exposed to condensation, air-indoor uncontrolled, and air-outdoor environments
- Cracking of aluminum ~~and stainless steel~~ exposed to condensation environments
- Hardening and loss of strength for elastomer-based mechanical sealants ~~and flexible connections~~ in HVAC systems

The External Surfaces Monitoring Program is a condition monitoring program that consists of visual inspections and surveillance activities of accessible external surfaces on a frequency that generally exceeds once per fuel cycle. Surfaces that are inaccessible during normal plant operation are inspected during refueling outages. Surfaces that are inaccessible or not readily visible during both plant operations and refueling outages, such as surfaces that are insulated, are inspected opportunistically, for example during maintenance activities during which insulation is removed.

The External Surfaces Monitoring Program is supplemented by the Aboveground Steel Tanks Inspection to manage loss of material for the inaccessible external surfaces of the carbon steel condensate storage tanks (i.e., the tank bottom).

NUREG-1801 Consistency

The External Surfaces Monitoring Program is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M36, "External Surfaces Monitoring."

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Scope of Program –**
  - Add aluminum, copper alloy, copper alloy >15% Zn, gray cast iron, stainless steel (including CASS), and elastomers to the scope of the program.
  - Add cracking as an aging effect for aluminum ~~and stainless steel~~ components.
  - Add hardening and loss of strength as aging effects for elastomer-based mechanical sealants ~~and flexible connections~~ in HVAC systems.
- **Monitoring and Trending –**
  - Add physical examination techniques in addition to visual inspection to detect hardening and loss of strength for elastomer-based mechanical sealants ~~and flexible connections~~ in HVAC systems.
  - Add visual (VT-1 or equivalent) or volumetric examination techniques to detect cracking.

Operating Experience

The elements that comprise the External Surfaces Monitoring Program are consistent with industry practice and have proven effective in maintaining the material condition of Columbia plant systems and components.

A review of the most recent plant-specific operating experience, through a search of condition reports, revealed that minor component leakage (typically at bolted joints and closures), damage (event-driven, not age-related), and degradation are routinely identified by the External Surfaces Monitoring Program, with subsequent corrective actions taken in a timely manner; and that no loss of pressure boundary integrity has occurred that was, or could have been, attributed to the aging effects that are in the scope of the program.

Operating experience associated with the External Surfaces Monitoring Program is routinely documented and communicated to site personnel in System Health Reports. System Health Reports are updated after significant changes, or at least quarterly.

Conclusion

The External Surfaces Monitoring Program will detect and manage loss of material for aluminum, copper alloy, copper alloy >15% Zn, gray cast iron, stainless steel (including CASS), and steel components. The continued implementation of the External Surfaces Monitoring Program, with the required enhancements, provides reasonable assurance that the effects of aging, including cracking for aluminum ~~and stainless steel~~ components and hardening and loss of strength for elastomer-based mechanical sealants ~~and flexible connections~~ in HVAC systems, will be managed such that components subject to aging management will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Program

B.2.27 Flexible Connection Inspection

Program Description

Replace with Insert A on page B-115a

~~The Flexible Connection Inspection is a new one-time inspection that will detect and characterize the material condition of elastomer components that are exposed to treated water, dried air, gas, and indoor air environments. The inspection provides direct evidence as to whether, and to what extent, hardening and loss of strength due to thermal exposure and ionizing radiation has occurred or is likely to occur that could result in a loss of intended function of the elastomer components.~~

Program

Implementation of the Flexible Connection Inspection will ensure that the pressure boundary integrity of susceptible components is maintained consistent with the current licensing basis during the period of extended operation.

Insert B on page B-115a

NUREG-1801 Consistency

~~The Flexible Connection Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, "One-Time Inspection," with exceptions:~~

Exceptions to NUREG-1801

Replace with Insert C on page B-115a

~~Program Elements Affected:~~

None.

~~• **Parameters Monitored or Inspected; Detection of Aging Effects**~~

~~In addition to visual examination techniques, the Flexible Connection Inspection will include physical examination techniques, such as physical manipulation and prodding.~~

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program

~~A representative sample of components at susceptible locations will be examined for evidence of hardening and loss of strength (due to thermal exposure and ionizing radiation), or to confirm a lack thereof.~~

Replace with Insert D on page B-115b

~~The Flexible Connection Inspection focuses on a limited but representative sample population of subject components at susceptible locations to be defined in the implementing documents, to include internal and external surfaces of flexible connections exposed to treated water, dried air, gas, and indoor air environments. The inspections performed will be used to provide symptomatic evidence of~~

Insert A into page B-115

The Flexible Connection Inspection Program is a new plant-specific program for Columbia. The program will consist of inspections of elastomer components that are exposed to treated water, dried air, gas, and indoor air environments. The Flexible Connection Inspection Program will manage degradation of elastomer components, including the effects of loss of material due to wear and hardening and loss of strength due to thermal exposure and ionizing radiation.

The Flexible Connection Inspection Program will comprise baseline inspections prior to the period of extended operation followed by opportunistic inspections, when components are opened for maintenance, repair, or surveillance, to ensure that the existing environmental conditions in subject components are not causing material degradation that could result in a loss of component intended function during the period of extended operation.

Insert B into page B-115

Implementation of the program will also provide assurance (and confirmation) that the structural integrity of susceptible nonsafety-related components will be maintained such that spatial interactions (e.g., leakage) will not result in the loss of any safety-related component intended functions during the period of extended operation.

The Flexible Connection Inspection Program is a new condition-monitoring program. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

Insert C into page B-115

The Flexible Connection Inspection Program is a new plant-specific Columbia program for License Renewal. NUREG-1801 includes an Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (XI.M38) that is focused on steel components and the loss of material aging effect. Rather than necessitating enhancements and exceptions to the NUREG-1801 program, a plant-specific program is credited.

The Flexible Connection Inspection Program is a new plant-specific program that is evaluated against the ten elements described in Appendix A of the Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, NUREG-1800, Revision 1. The results of an evaluation for each element are provided below.

Insert D into page B-115

Prior to the period of extended operation, the Flexible Connection Inspection Program identifies conditions relative to the following subject mechanical components to determine whether, and to what extent, degradation is occurring and to provide a baseline for future inspections.

The scope of the Flexible Connection Inspection Program includes the surfaces of elastomer flexible connections exposed to treated water, dried air, gas, and indoor air environments in the following systems.

- Containment Exhaust Purge (CEP)
- Containment Supply Purge (CSP)
- Diesel Building HVAC
- Diesel Cooling Water (DCW)
- Diesel Fuel Oil (DO)
- Fire Protection (FP)
- Pump House HVAC
- Radwaste Building HVAC
- Reactor Building HVAC
- Standby Gas Treatment (SGT)

The baseline inspection portion of Flexible Connection Inspection Program focuses on a representative sample population of subject components at susceptible locations to be defined in the implementing documents, to include internal and external surfaces of flexible connections exposed to treated water, dried air, gas, and indoor air environments. The inspections performed will be used to provide symptomatic evidence of loss of material due to wear and hardening and loss of strength at the other susceptible, but possibly inaccessible, locations due to the similarities in materials and environmental conditions. Subsequent inspections are opportunistic when components are opened for periodic maintenance, repair, and surveillance activities when surfaces are made available for inspection.

~~hardening and loss of strength at the other susceptible, but possibly inaccessible, locations due to the similarities in materials and environmental conditions.~~

Program does not include any actions

The

- Preventive Actions

~~No actions are taken as part of the~~ Flexible Connection Inspection to prevent aging effects or to mitigate aging degradation.

This program is a condition monitoring program.

Program

- Parameters Monitored or Inspected

The parameters to be inspected by the Flexible Connection Inspection include visual evidence of surface degradation, such as cracking or discoloration, as well as physical manipulation and prodding, as measures of hardening and loss of strength. ~~Inspections will be performed by qualified personnel using established techniques, such as NDE, consistent with the requirements of 10 CFR 50 Appendix B.~~

loss of material (due to wear),

Insert A on page B-116a

- Detection of Aging Effects

~~The Flexible Connection Inspection will use established visual examination techniques (such as equivalent to VT-1 or VT-3), as well as physical manipulation, performed by qualified personnel on a sample population of subject components to identify evidence of hardening and loss of strength.~~

Replace with Insert B on page B-116a

~~The sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and design margins.~~

~~The Flexible Connection Inspection will be conducted within the 10 year period prior to the period of extended operation.~~

- Monitoring and Trending

~~This one time inspection activity is used to characterize conditions and determine if, and to what extent, further actions may be required. The activity includes provisions for increasing the inspection sample size and location if degradation is detected.~~

Replace with Insert C on page B-116b

~~The sample size will be determined by engineering evaluation of the materials of construction, the environment (i.e., service conditions), aging effects, and operating experience (e.g., time in service, most susceptible locations, lowest design margins). Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action process to determine the need for subsequent aging management activities and for monitoring and trending of the results.~~

- Acceptance Criteria

Replace with Insert D on page B-116b

~~Indications or relevant conditions of degradation detected during the inspection will be compared to pre determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective~~

Insert A into page B-116

Inspections will be performed by qualified personnel using the appropriate established nondestructive examination techniques, primarily visual and augmented by physical manipulation or prodding.

Insert B into page B-116

The Flexible Connection Inspection Program provides for detection of aging effects prior to a loss of component intended function. Inspections will include a combination of visual and physical manipulation performed by qualified personnel.

Baseline inspections will be established on a sample population of subject components determined by engineering evaluation to identify evidence of loss of material due to wear and hardening and loss of strength due to thermal exposure and ionizing radiation prior to the period of extended operation. Opportunistic inspections will be conducted, thereafter, when components are opened for maintenance, repair, or surveillance and surfaces are made available for inspection.

For baseline inspections, the sample population will be 20% of the total population for each material - environment - aging effect group, up to a maximum of 25 inspections per group and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operation, and the lowest design margins.

Inspection of the sample population will be conducted within the 10-year period prior to the period of extended operation, and will serve as a baseline for future inspections. Any evidence of degradation that could lead to a loss of component intended function will be documented and evaluated through the Columbia corrective action program, including provisions for increasing the inspection sample size and locations.

Insert C into page B-116

The Flexible Connection Inspection Program comprises baseline inspections prior to the period of extended operation and opportunistic inspections when components are opened for maintenance, repair, or surveillance thereafter. Baseline inspections are used to characterize material conditions and include provisions for increasing the inspection sample size and locations if degradation is detected. The results of baseline inspections are considered to ensure that opportunistic inspections thereafter will detect aging prior to a loss of component intended function.

The sample size for baseline inspections will be determined by engineering evaluation of the materials of construction, the environment (i.e., service conditions), aging effects, and operating experience (e.g., time in-service, most susceptible locations, lowest design margins, etc.). Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action program.

Inspection findings will be documented and evaluated by assigned engineering personnel. The inspection findings will be reviewed to ensure that each material-environment has been examined via opportunistic inspection within a 5 year time period. If opportunistic inspections have not occurred within the 5-year interval, appropriate actions will be taken to ensure these inspections are performed. Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action program with subsequent adjustments to the program made as necessary.

Insert D into page B-116

Indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria established by engineering evaluation of the pertinent design standard.

Unacceptable inspection findings will include visual evidence of surface degradation, such as cracking or discoloration, as well as physical manipulation and prodding, as measures of loss of material due to wear and hardening and loss of strength that could lead to a loss of component intended function during the period of extended operation.

If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation or prior to the next opportunity for inspection.

~~action program to determine whether they could result in a loss of component intended function during the period of extended operation.~~

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience

Replace with Insert A on page B-117a

~~The Flexible Connection Inspection is a new one-time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effect. The activity provides confirmation of conditions where degradation is not expected, has not evidenced as a problem, or where the aging mechanism is slow acting.~~

, Revision 1,

NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; ~~none was identified.~~ Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

Replace with Insert B on page B-117a

A review of Columbia operating experience to date has identified no issues for the flexible connections in the systems within the scope of this inspection. However, tears have been found in several suction and discharge boots (flexible connections) on air-handling units of the HVAC systems. The tears were attributed to normal operational wear; the boots remained pliable (i.e., no hardening) and no operability issues were identified. ~~These flexible connections are included in the scope of the External Surfaces Monitoring Program.~~

Replace with Insert C on page B-117a

~~The site corrective action program and an ongoing review of industry operating experience will be used to ensure that a one-time inspection activity remains the appropriate method for managing the effects of aging for systems within the scope of this activity.~~

Replace with Insert D on page B-117a

Insert A into page B-117

The Flexible Connection Inspection Program is a new plant-specific program for which plant operating experience has not shown the occurrence of the aforementioned aging effects, with the exception of loss of material due to wear, which will also be managed by this program. As discussed below, tears were found in the HVAC boots, but no other flexible connections showed evidence of wear. The program provides confirmation of material conditions before entering the period of extended operation, and detection of aging effects prior to loss of component intended function during the period of extended operation. The elements comprising the program are to be consistent with industry practice.

Insert B into page B-117

with only general indication that inspection of internal surfaces during the performance of periodic surveillance and maintenance activities has proven effective in maintaining the material condition of plant systems, structures, and components.

Insert C into page B-117

Because of this operating experience, loss of material due to wear will also be managed by this program.

Insert D into page B-117

This operating experience supports that baseline inspections, to determine actual material conditions, prior to the period of extended operation and opportunistic inspections thereafter will, in conjunction with the normal operating experience review process, ensure aging is detected prior to a loss of component intended function. The site corrective action program and an ongoing review of industry operating experience will be used to ensure that component intended functions will be maintained during the period of extended operation.

Required Enhancements

Not applicable, this is a new ~~activity.~~ program

Program will provide reasonable assurance that the aging effects will be managed such that

Conclusion

Implementation of the Flexible Connection Inspection ~~will verify that there are no aging effects requiring management for the subject components or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that~~ the component intended functions of the subject components will be maintained consistent with the current licensing basis during the period of extended operation.

and that spatial interactions (e.g., leakage) will not result in a loss of safety-related component intended functions during the period of extended operation

LRA Amendment 21
Monitoring & Collection Systems Inspection Program
Revised Pages

Letter dated August 26th, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML102300229)

Letter dated September 16th, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML102450727)

LRA Page number	LRA Page number	LRA Page number
3.3-26	3.3-99	B-18
3.3-28	3.3-101	B-18b
3.3-29	3.3-104	B-23
3.3-31	3.3-105	B-159
3.3-32	3.3-107	B-159a
3.3-37	A-4	B-160
3.3-44	A-22	B-160a
3.3-52	A-22a	B-160b
3.3.53a	A-57	B-161
3.3-64	A-57a	B-161a
3.3-71	B-4	B-162
3.3-81	B-14	B-162a

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Equipment Drains Radioactive System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Equipment Drains Radioactive System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Monitoring and Collection Systems Inspection
- Supplemental Piping/Tank Inspection

Program

3.3.2.1.22 Fire Protection System

Materials

The materials of construction for subject mechanical components of the Fire Protection (FP) System are:

- Aluminum Alloy
- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Glass
- Gray cast iron
- Polymer
- Stainless steel
- Steel

- Fuel Oil Chemistry
- Heat Exchangers Inspection
- Lubricating Oil Analysis Program
- Lubricating Oil Inspection
- Selective Leaching Inspection
- Supplemental Piping/Tank Inspection

3.3.2.1.23 Floor Drain System

Materials

The material of construction for subject mechanical components of the Floor Drain System is:

- Steel

Environments

Subject mechanical components of the Floor Drain System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Concrete
- Moist air
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Floor Drain System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Floor Drain System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Monitoring and Collection Systems Inspection
- Supplemental Piping/Tank Inspection

Program

3.3.2.1.24 Floor Drain Radioactive System

Materials

The materials of construction for subject mechanical components of the Floor Drain Radioactive System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Floor Drain Radioactive System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Concrete
- Raw water
- Treated water

Add "Moist air" as new bullet in the list of environments

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Floor Drain Radioactive System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Floor Drain Radioactive System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- External Surfaces Monitoring Program
- Monitoring and Collection Systems Inspection
- Supplemental Piping/Tank Inspection

Program

21

Amendment 1

- Heat Exchangers Inspection
- Monitoring and Collection Systems Inspection Program
- Supplemental Piping/Tank Inspection

3.3.2.1.26 Miscellaneous Waste Radioactive System

Materials

The materials of construction for subject mechanical components of the Miscellaneous Waste Radioactive System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Miscellaneous Waste Radioactive System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Concrete
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Miscellaneous Waste Radioactive System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Miscellaneous Waste Radioactive System:

- Bolting Integrity Program
- Monitoring and Collection Systems Inspection Program

3.3.2.1.27 Plant Sanitary Drains System

Materials

The material of construction for subject mechanical components of the Plant Sanitary Drains System is:

- Steel

Environments

Subject mechanical components of the Plant Sanitary Drains System are exposed to the following normal operating environments:

- Condensation
- Moist air
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Plant Sanitary Drains System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Plant Sanitary Drains System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Monitoring and Collection Systems Inspection

Program

3.3.2.1.28 Plant Service Water System

Materials

The materials of construction for subject mechanical components of the Plant Service Water System are:

- Gray cast iron
- Stainless steel

3.3.2.1.33 Process Sampling Radioactive System

Materials

The materials of construction for subject mechanical components of the Process Sampling Radioactive System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Process Sampling Radioactive System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Raw water
- Treated water
- Treated water > 60 °C (140 °F)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Process Sampling Radioactive System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Process Sampling Radioactive System:

- Bolting Integrity Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Monitoring and Collection Systems Inspection Program

- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Monitoring and Collection Systems Inspection Program
- Open-Cycle Cooling Water Program
- Supplemental Piping/Tank Inspection

3.3.2.1.39 Reactor Water Cleanup System

Materials

The materials of construction for subject mechanical components of the Reactor Water Cleanup System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Reactor Water Cleanup System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Closed cycle cooling water
- Closed cycle cooling water > 60 °C (140 °F)
- Treated water
- Treated water > 60 °C (140 °F)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Reactor Water Cleanup System:

- Cracking
- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Reactor Water Cleanup System:

- Bolting Integrity Program

3.3.2.2.7.2 BWR Reactor Water Cleanup and Shutdown Cooling Systems

Loss of material due to general, pitting, and crevice corrosion for steel piping components, accumulators, tanks, and heat exchanger components exposed to treated water is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components, accumulators, tanks, and heat exchanger components.

The one exception is the Equipment Drains Radioactive System, for which loss of material for piping and piping components with a structural integrity function is managed by the Monitoring and Collection Systems Inspection ~~which is a new one-time inspection that will detect and characterize loss of material.~~ Program.

3.3.2.2.7.3 Diesel Exhaust Piping, Piping Components, and Piping Elements

During normal plant operations, diesel exhaust piping, piping components, and piping elements are exposed to diesel exhaust gases infrequently and for short durations. For the remaining time, these components are exposed internally to outdoor air. The configuration of the diesel exhaust has the potential for collection of moisture inside the piping, piping components, and piping elements. With the combination of this potential for moisture collection and the infrequent exposure to diesel exhaust gases, loss of material due to crevice, general and pitting corrosion is an aging effect requiring management for steel (exhaust) piping exposed internally to outdoor air. This loss of material is managed by the Diesel Systems Inspection or the Diesel-Driven Fire Pumps Inspection, ~~which are new one-time inspections that will detect and characterize loss of material on the internal surface of diesel exhaust piping, piping components, and piping elements.~~ Program Program

3.3.2.2.8 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion (MIC)

Loss of material due to general, pitting, and crevice corrosion and microbiologically-influenced corrosion (MIC) for steel piping components, and the steel diesel fuel oil storage tank, with coatings buried in soil is managed by the Buried Piping and Tanks Inspection Program.

3.3.2.2.9 Loss of Material due to General, Pitting, Crevice, Microbiologically Influenced Corrosion, and Fouling

3.3.2.2.9.1 Piping, Piping Components, and Piping Elements – Fuel Oil

Loss of material due to general, pitting, and crevice corrosion and MIC for steel piping components and tanks exposed to fuel oil is managed by the Fuel Oil Chemistry Program. The Fuel Oil Chemistry Program manages aging effects through periodic

Insert A to pages 3.3-53 and 3.3-54

3.3.2.2.10.2 Piping, Piping Components, Piping Elements, and Heat Exchanger Components

Loss of material due to pitting and crevice corrosion for stainless steel heat exchanger components and stainless steel piping components exposed to treated water is managed by the BWR Water Chemistry Program. Additionally, loss of material for the aluminum spent fuel pool gates, stainless steel storage racks, and stainless steel storage rack neutron absorber sheathing exposed to treated water is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material through examination of stainless steel heat exchanger, piping, aluminum spent fuel pool gates, and stainless steel spent fuel storage racks components.

Loss of material due to pitting and crevice corrosion for components in the Process Sampling Radioactive and Equipment Drains Radioactive systems that are not submerged within the suppression pool is managed by the Monitoring and Collection Systems Inspection, which will ~~detect and characterize~~ loss of material.

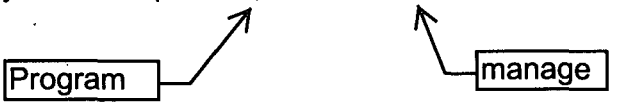


Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-17	Steel piping, piping components, and piping elements exposed to treated water	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for steel piping, piping components, and piping elements in the auxiliary systems that are exposed to treated water. In the Equipment Drains Radioactive System, the Monitoring and Collection Systems Inspection is credited for piping and piping components with a structural integrity function. A Note E is applied. This item is also applied to accumulators, tanks, and heat exchanger components. A Note C is applied. Refer to Section 3.3.2.2.7.2 for further information.

Program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-24 (cont'd)					This item is also applied to stainless steel piping, piping components, and piping elements in the Equipment Drains Radioactive and Process Sampling Radioactive systems, for which the Monitoring and Collection Systems Inspection Program is credited. A Note E is applied. Refer to Section 3.3.2.2.10.2 for further information. Refer also to Table 3.5.2-2.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-37 (cont'd)					For stainless steel piping, piping components, and piping elements that are exposed to treated water >60 °C (>140 °F) in the Process Sampling Radioactive System, the Monitoring and Collection Systems Inspection is credited. A Note E is applied.
3.3.1-38	Stainless steel piping, piping components, and piping elements exposed to treated water >60 °C (>140 °F)	Cracking due to stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	The BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage cracking for stainless steel piping, piping components, and piping elements in the auxiliary systems that are exposed to treated water >60 °C (>140 °F). A Note E is applied where the Chemistry Program Effectiveness Inspection is credited instead of the BWR Stress Corrosion Cracking Program.

Program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-68	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801. Except as noted below, the Fire Water Program is credited to manage loss of material for steel piping and piping components in the auxiliary systems that are exposed to raw water. This item is also applied to heat exchanger components that are exposed to raw water in the Fire Protection System, for which the Diesel-Driven Fire Pumps Inspection is credited. A Note E is applied. For steel piping and piping components that are exposed to raw water in the Fuel Pool Cooling, Plant Sanitary Drains, and Reactor Closed Cooling Water systems, the Monitoring and Collection Systems Inspection is credited; in the Potable Cold Water System the *Potable Water Monitoring* Program is credited. A Note E is applied.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-71	Steel piping, piping components, and piping elements exposed to moist air or condensation (Internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Replace deleted text with Insert A from page 33-101a	No	The following programs are credited to manage loss of material for steel piping, piping components, and tanks in the auxiliary systems that are exposed to moist air or condensation (internal): • Cooling Units Inspection for drain piping in HVAC systems exposed to condensation (internal) • Monitoring and Collection Systems Inspection for air-water interfaces in Plant Sanitary Drain System piping evaluated as exposed to moist air (internal) • ~~Supplemental Piping/Tank Inspection for air-water interfaces in piping and tanks evaluated as exposed to moist air (internal)~~ A Note E is applied in each case.

Program

Program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-76	Steel piping, piping components, and piping elements (without lining/coating or with degraded lining/coating) exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining/coating degradation	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Except as noted below, the Open-Cycle Cooling Water *Program is credited to manage* loss of material for steel piping, piping components, and piping *elements that are exposed to raw* water. For steel piping and piping components in the other auxiliary systems that are exposed to raw water, the following *programs are* credited to manage loss of material: • Diesel Starting Air Inspection for drain piping in Diesel Starting Air System • Diesel Systems Inspection for drain piping in the Diesel (Engine) Exhaust System • Monitoring and Collection Systems Inspection for ~~drain~~ piping in Equipment Drains Radioactive, Floor Drain, and *Floor Drain Radioactive* systems

Program

Program

Replace deleted text with: "drain piping and tanks"

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-76 (cont'd)					• Potable Water Monitoring Program for air washers and associated components in the Reactor Building HVAC System A Note E is applied in each case.
3.3.1-77	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Except as noted below, the Open-Cycle Cooling Water Program is credited to manage loss of material for steel heat exchanger components in the auxiliary systems that are exposed to raw water. For steel heat exchanger components that are exposed to raw water in the Equipment Drains Radioactive System, the Monitoring and Collection Systems Inspection is credited. A Note E is applied.

Program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-79	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Except as noted below, the Open-Cycle Cooling Water Program is credited to manage loss of material for stainless steel piping, piping components, and piping elements in the auxiliary systems that are exposed to raw water. For stainless steel piping, piping components, and piping elements that are exposed to raw (drainage) water in the Equipment Drains Radioactive, Floor Drain Radioactive, Fuel Pool Cooling, Miscellaneous Waste Radioactive, Process Sampling Radioactive, and Reactor Closed Cooling Water systems, the Monitoring and Collection Systems Inspection Program is credited. A Note E is applied.

APPENDIX A
TABLE OF CONTENTS

The Metal-Enclosed Bus Program is a new aging management program that will be implemented prior to the period of extended operation. The thermography portion of the program will be performed once every 10 years, with the initial inspections to be performed prior to the period of extended operation. The visual inspection portion of the program will also be performed once every 10 years, with the first inspections to be performed prior to the period of extended operation.

Program

A.1.2.41 Monitoring and Collection Systems Inspection

Insert A from Page A-22a

~~The Monitoring and Collection Systems Inspection detects and characterizes the condition of materials at the internal surfaces of subject mechanical components that are exposed to equipment or area drainage water and other potential contaminants and fluids. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion or erosion has occurred. The inspection also determines whether cracking due to SCC of susceptible materials has occurred.~~

~~The Monitoring and Collection Systems Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10 year period prior to the period of extended operation.~~

A.1.2.42 Open-Cycle Cooling Water Program

The Open-Cycle Cooling Water Program manages ~~cracking due to SCC of susceptible materials and~~ loss of material due to corrosion and erosion for components located in the Standby Service Water and Plant Service Water systems, and for components connected to or serviced by those systems. The program manages fouling due to particulates (e.g., corrosion products) and biological material (micro- or macro-organisms) resulting in reduction in heat transfer for heat exchangers (including condensers, coolers, cooling coils, and evaporators) within the scope of the program. The Open-Cycle Cooling Water Program also manages loss of material for components associated with the feed-and-bleed mode for emergency makeup water to the spray pond.

The Open-Cycle Cooling Water Program consists of inspections, surveillances, and testing to detect the presence, and assess the extent of ~~cracking, fouling,~~ and loss of material. The inspection activities are combined with chemical treatments and cleaning activities to minimize the effects of aging. The program is a combination condition monitoring and mitigation program that implements the recommendations of NRC Generic Letter 89-13 for safety-related equipment in the scope of the program. The scope of the program also includes non-safety related components containing either service water or spray pond makeup water.

Insert: "fouling"

The Open-Cycle Cooling Water Program is an existing program that requires enhancement prior to the period of extended operation.

Insert A into page A-22

The Monitoring and Collection Systems Inspection Program manages the effects of loss of material due to corrosion or erosion for the internal surfaces of subject mechanical components that are exposed to equipment or area drainage water and other potential contaminants and fluids. The program also manages cracking due to stress corrosion cracking of susceptible materials.

The Monitoring and Collection Systems Inspection Program is a new program that will be implemented via baseline inspection of a sample population followed by opportunistic inspections when components are opened for periodic maintenance, repair, and surveillance activities when surfaces are made available for inspection. These inspections ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

Infra-red window installation at bolted connections of the in-scope bus will be completed prior to the initial thermography inspection, discussed above.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
40) Metal-Enclosed Bus Program	The Metal-Enclosed Bus Program is a new program. The Metal-Enclosed Bus Program is an inspection program that detects degradation of metal-enclosed bus within the scope of license renewal. The program provides for the visual inspection of interior sections of bus, and an inspection of the elastomeric seals at the joints of the duct sections. The program also makes provision for thermographic inspection of bus bolted connections. The thermography portion of the program will be performed once every 10 years, with the initial inspections to be performed prior to the period of extended operation. The visual inspection portion of the program will also be performed once every 10 years, with the first inspections to be performed prior to the period of extended operation.	A.1.2.40	Implementation prior to the period of extended operation. Then ongoing.
41) Monitoring and Collection Systems Inspection Program	~~The Monitoring and Collection Systems Inspection is a new activity. The Monitoring and Collection Systems Inspection detects and characterizes the condition of materials at the internal surfaces of subject mechanical components that are exposed to equipment or area drainage water and other potential contaminants and fluids. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.~~	A.1.2.41	~~Within the 10-year period prior to the period of extended operation.~~

Replace with Insert A on page A-57a

Replace with Insert B on page A-57a

Insert A into page A-57

The Monitoring and Collection Systems Inspection Program is a new program.

The Monitoring and Collection Systems Inspection Program manages the effects of loss of material due to corrosion or erosion for the internal surfaces of subject mechanical components that are exposed to equipment or area drainage water and other potential contaminants and fluids. The program also manages cracking due to stress corrosion cracking of susceptible materials.

The program consists of baseline inspections prior to the period of extended operation followed by opportunistic inspections during the period of extended operation.

Following the baseline inspection, inspection findings will be reviewed periodically to ensure that each material and environment combination has been examined via opportunistic inspection or actions are taken to ensure inspections are performed. Initial interval for review of inspection findings is 5 years and may be adjusted based on operating experience.

Insert B into page A-57

Implementation prior to the period of extended operation and initial inspection within the 10-year period prior to the period of extended operation. Then ongoing.

APPENDIX B
TABLE OF CONTENTS

Program

Power

Program

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program See Section B.2.46.
XI.M32	One-Time Inspection	Chemistry Program Effectiveness Inspection See Section B.2.12. ~~Cooling Units Inspection~~ ~~See Section B.2.14.~~ ~~Diesel Driven Fire Pumps Inspection~~ ~~See Section B.2.18.~~ Diesel Starting Air Inspection See Section B.2.16. ~~Diesel Systems Inspection~~ ~~See Section B.2.17.~~ ~~Flexible Connection Inspection~~ ~~See Section B.2.27.~~ Heat Exchangers Inspection See Section B.2.30. Lubricating Oil Inspection See Section B.2.37. ~~Monitoring and Collection Systems Inspection~~ ~~See Section B.2.41.~~ ~~Service Air System Inspection~~ ~~See Section B.2.48.~~ Supplemental Piping/Tank Inspection See Section B.2.51.
XI.M33	Selective Leaching of Materials	Selective Leaching Inspection See Section B.2.47.
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program See Section B.2.5.
XI.M35	One-time Inspection of ASME Code Class 1 Small-Bore Piping	~~Small Bore Class 1 Piping Inspection~~ See Section B.2.49.
XI.M36	External Surfaces Monitoring	External Surfaces Monitoring Program See Section B.2.23.

Insert A from Page B-14a

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	High-Voltage Porcelain Insulators Aging Management Program See Section B.2.31.
N/A	Plant-Specific Program	Potable Water Monitoring Program See Section B.2.43.
N/A	Plant-Specific Program	Preventive Maintenance – RCIC Turbine Casing See Section B.2.44.

Insert A from Page B-18a

Insert A from page B-18b after page B-18a from Amendment 2

Insert B from Page B-18b for Amendment 21

~~Amendment 14~~ Amendment 21

~~Amendment 2~~

Insert A to Page B-18

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	Service Level 1 Protective Coatings Program See Section B.2.55.

Insert B to Page B-18

N/A	Plant-Specific Program	Cooling Units Inspection Program See Section B.2.14.
N/A	Plant-Specific Program	Diesel Systems Inspection Program See Section B.2.17.
N/A	Plant-Specific Program	Diesel-Driven Fire Pumps Inspection Program See Section B.2.18.
N/A	Plant-Specific Program	Flexible Connection Inspection Program See Section B.2.27.
N/A	Plant-Specific Program	Monitoring and Collection Systems Inspection Program See Section B.2.41.
N/A	Plant-Specific Program	Service Air System Inspection Program See Section B.2.48.

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801
(continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Inservice Inspection (ISI) Program – IWF Section B.2.35	Existing	Yes	--	--	--
Lubricating Oil Analysis Program Section B.2.36	Existing	Yes	--	--	Yes
Lubricating Oil Inspection Section B.2.37	New	Yes	--	--	--
Masonry Wall Inspection Section B.2.38	Existing	Yes	--	--	Yes
Material Handling System Inspection Program Section B.2.39	Existing	Yes	--	--	~~Yes~~
Metal-Enclosed Bus Program Section B.2.40	New	--	Yes	--	--
Monitoring and Collection Systems Inspection Program Section B.2.41	New	~~Yes~~ --	--	~~--~~ Yes	--
Open-Cycle Cooling Water Program Section B.2.42	Existing	--	Yes	--	Yes
Potable Water Monitoring Program Section B.2.43	Existing	--	--	Yes	Yes

21
Amendment ~~1~~

B.2.41 Monitoring and Collection Systems Inspection

Program

Program Description

Insert A on page B-159a

~~The Monitoring and Collection Systems Inspection is a new one-time inspection that will detect and characterize the conditions on the internal surfaces of subject mechanical components that are exposed to equipment and area drainage water and other potential contaminants and fluids. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, galvanic, general, or pitting corrosion, erosion, or MIC has occurred. The inspection also provides direct evidence as to whether, and to what extent, cracking due to SCC of susceptible materials in susceptible locations has occurred.~~

Program

ensure

Implementation of the Monitoring and Collection Systems Inspection will ~~provide assurance (and confirmation)~~ that the pressure boundary of susceptible safety-related components is maintained consistent with the current licensing basis during the period of extended operation. Implementation of the ~~inspection~~ will also ~~provide assurance (and confirmation)~~ that the structural integrity of susceptible NSR components will be maintained such that spatial interactions (e.g., leakage) will not result in the loss of any safety-related component intended functions during the period of extended operation.

ensure

program

Insert B on page B-159a

NUREG-1801 Consistency

~~The Monitoring and Collection Systems Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, "One Time Inspection."~~

Insert C on page B-159a

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

baseline and opportunistic inspection of

Program

- Scope of Program
  The scope of the Monitoring and Collection Systems Inspection includes the internal surfaces of subject mechanical components in the following plant drainage and collection systems that are exposed to potentially radioactive drainage water (untreated water), and in systems with other potential contaminants and fluids during normal plant operations:
  - Equipment Drains Radioactive (EDR) System
  - Floor Drains (FD) System

Insert A into page B-159

The Monitoring and Collection Systems Inspection Program is a new plant-specific program for Columbia. The program will consist of inspections of subject mechanical components that are exposed to equipment and area drainage water and other potential contaminants and fluids. The Monitoring and Collection Systems Inspection Program will manage the effects of loss of material due to crevice, galvanic, general, or pitting corrosion, erosion, or microbiologically-influenced corrosion (MIC). The program will also manage the effects of cracking due to stress corrosion cracking (SCC) of susceptible materials in susceptible locations.

The Monitoring and Collection Systems Inspection Program will comprise baseline inspections prior to the period of extended operation followed by opportunistic inspections, when components are opened for maintenance, repair, or surveillance, to ensure that the existing environmental conditions in subject components are not causing material degradation that could result in a loss of component intended function during the period of extended operation.

Insert B into page B-159

The Monitoring and Collection Systems Inspection Program is a new condition-monitoring program. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

Insert C into page B-159

The Monitoring and Collection Systems Inspection Program is a new plant-specific program for Columbia for License Renewal. NUREG-1801 includes an Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (XI.M38) that is focused on steel components and the loss of material aging effect. Rather than necessitating enhancements and exceptions to the NUREG-1801 program, a plant-specific program is credited.

The Monitoring and Collection Systems Inspection Program is a new plant-specific program that is evaluated against the ten elements described in Appendix A of the Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, NUREG-1800, Revision 1. The results of an evaluation for each element are provided below.

- Floor Drains Radioactive (FDR) System
- Fuel Pool Cooling (FPC) System
- Miscellaneous Waste Radioactive (MWR) System
- Plant Sanitary Drains (PSD) System
- Process Sampling Radioactive (PSR) System
- Reactor Closed Cooling (RCC) Water System

Add: Process Sampling (PS) System

Insert B from Page B-160a

~~A representative sample of components in these systems, to be defined in the implementing documents, and to include containment isolation piping and valve bodies, will be examined for evidence of a loss of material (due to crevice, galvanic, general, or pitting corrosion, erosion, or MIC), or to confirm a lack thereof, and the results applied to all of the systems and components within the scope of the inspection, based on engineering evaluation. In addition, the representative sample will include stainless steel components exposed to temperatures greater than 140 °F that will be examined for evidence of cracking due to SCC.~~

Replace with Insert A on page B-160a

- Preventive Actions

T

~~No actions are taken as part of~~ the Monitoring and Collection Systems Inspection to prevent aging effects or to mitigate aging degradation.

It is a condition monitoring program.

Program does not include any actions

- Parameters Monitored or Inspected

Insert C from Page B-160b

~~The parameters to be inspected by the Monitoring and Collection Systems Inspection include wall thickness or visual evidence of internal surface degradation, as measures of a loss of material or cracking in susceptible materials. Inspections will be performed by qualified personnel using established NDE techniques.~~

- Detection of Aging Effects

Insert D from Page B-160a

~~The Monitoring and Collection Systems Inspection will use a combination of established volumetric and visual examination techniques (such as equivalent to VT-1 or VT-3) performed by qualified personnel on a sample population of subject components to identify evidence of loss of material or cracking in susceptible materials or to confirm a lack thereof on the susceptible internal surfaces of the components.~~

~~The sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and the lowest design margins. The sample population will include at least one location for containment isolation components.~~

~~Insert A to Page B-160~~

~~In addition, the representative sample will include stainless steel components exposed to temperatures greater than 140 ºF and copper alloy> 15% Zn components exposed to raw water that will be examined for evidence of cracking due to SCC.~~

Insert B into page B-160 for Amendment 21

The baseline inspection portion of the Monitoring and Collection Systems Inspection Program focuses on a representative sample population of subject components in these systems, to be defined in the implementing documents, and to include containment isolation piping and valve bodies, will be examined for evidence of loss of material (due to crevice, galvanic, general, or pitting corrosion, erosion, or MIC), or to confirm a lack thereof, and the results applied to the rest of the system based on engineering evaluation. In addition, the representative sample will include stainless steel components exposed to temperatures greater than 140°F and copper alloy >15% Zn that will be examined for evidence of cracking due to SCC. Subsequent inspections are opportunistic when components are opened for periodic maintenance, repair, and surveillance activities when surfaces are made available for inspection.

Insert C into page B-160 for Amendment 21

The parameters to be inspected by the Monitoring and Collection Systems Inspection Program include wall thickness or evidence of internal surface degradation, as measures of loss of material or cracking in susceptible materials.

Inspections will be performed by qualified personnel using the appropriate established nondestructive examination (NDE) techniques, primarily visual, with enhanced visual, surface, or volumetric techniques used depending on the aging effect.

Insert D into page B-160

The Monitoring and Collection Systems Inspection Program provides for detection of aging effects prior to a loss of component intended function. Inspections will include a combination of established visual or enhanced visual (e.g., VT-1 or VT-3 or equivalent), volumetric (e.g., radiographic testing or ultrasonic testing), and surface examination techniques performed by qualified personnel.

Baseline inspections will be established on a sample population of subject components determined by engineering evaluation to identify evidence of cracking or loss of material prior to the period of extended operation. Opportunistic inspections will be conducted, thereafter, when components are opened for maintenance, repair, or surveillance, and surfaces are available for inspection.

For baseline inspections, the sample population will be 20% of the total population for *each material - environment - aging effect group, up to a maximum of 25 inspections* per group, and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and the lowest design margins.

Inspection of the sample population will be conducted within the 10-year period prior to the period of extended operation, and will serve as a baseline for future inspections. Any evidence of degradation that could lead to a loss of component intended function will be documented and evaluated through the Columbia corrective action program, including provisions for increasing the inspection sample size and locations.

~~The Monitoring and Collection Systems Inspection activities will be conducted within the 10 year period prior to the period of extended operation.~~

- Monitoring and Trending

~~This one time inspection activity is used to characterize conditions and determine if, and to what extent, further actions may be required. The activity includes provisions for increasing the inspection sample size and location if degradation is detected.~~

Insert A from Page B-161a

~~The sample size will be determined by engineering evaluation of the materials of construction, environment (i.e., service conditions), aging effects, and operating experience (e.g., time in service, most susceptible locations, lowest design margins). Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action process to determine the need for subsequent aging management activities and for monitoring and trending of the results.~~

- Acceptance Criteria

~~Indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.~~

Insert B from Page B-161a

- Corrective Actions

This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process

This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls

This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience

The Monitoring and Collections Systems Inspection is a new ~~one-time inspection activity~~ for which plant operating experience has not shown the need to manage the aforementioned aging effects for the in-scope systems. The ~~inspection~~ provides for confirmation of material conditions ~~near~~ the period of extended operation. The elements comprising the ~~inspection activity are to~~ be consistent with industry practice.

Program
plant-specific program
program
before entering
will
program activities
, and detection of aging effects prior to a loss of component intended function during the period of extended operation

Insert A into page B-161

The Monitoring and Collection Systems Inspection Program comprises baseline inspections prior to the period of extended operation and opportunistic inspections when components are opened for maintenance, repair, or surveillance thereafter. Baseline inspections are used to characterize material conditions and include provisions for increasing the inspection sample size and locations if degradation is detected. The results of baseline inspections are considered to ensure that opportunistic inspections thereafter will detect aging prior to a loss of component intended function.

The sample population for baseline inspections will be determined by engineering evaluation of the materials of construction, the environment (i.e., service conditions), aging effects, and of operating experience (e.g., time in-service, most susceptible locations, lowest design margins, etc.). Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action program.

Inspection findings will be documented and evaluated by assigned engineering personnel. The inspection findings will be reviewed to ensure that each material and environment combination has been examined via opportunistic inspection within a 5 year time period. If opportunistic inspections have not occurred within the 5-year interval, appropriate actions will be taken to ensure these inspections are performed. Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action program, with subsequent adjustments to the program made as necessary.

Insert B into page B-161

Indications or relevant conditions of degradation detected during the inspection will be compared to pre-determined acceptance criteria established by engineering evaluation of the pertinent design standard.

Unacceptable inspection findings will include visual evidence of a loss of material, a reduction in wall thickness where appropriate, or evidence of cracking obtained by enhanced visual, surface, or volumetric examination.

If the acceptance criteria are not met, then the indications and conditions will be evaluated under the Columbia corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation or prior to the next opportunity for inspection.

, Revision 1

NUREG-1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability~~; none was identified.~~ Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.

Insert A from Page B-162a

s

A review of Columbia operating experience to date identified ~~an~~ occurrence of loss of material due to corrosion within the FDR System in 2003. The susceptible FDR piping and valves were subsequently re-designed to eliminate standing water and replaced with a corrosion resistant, stainless steel, material in 2005. ~~No additional instances of corrosion have occurred in the FDR System since the implementation of the modification~~.

Insert B from Page B-162a

The site corrective action program, and an ongoing review of industry operating experience, will be used to ensure that ~~the identified aging effects do not require management for the systems within the scope of this activity~~ the program is effective in managing the effects of aging for components within the scope of this program during the period of extended operation.

Required Enhancements

Not applicable, this is a new ~~activity~~ program.

Conclusion

Program

Implementation of the Monitoring and Collection Systems Inspection will ~~verify that there are no aging effects requiring management for the subject components, or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure that~~ provide reasonable assurance that the aging effects will be managed such that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation, and that spatial interactions (e.g., leakage) will not result in loss of safety-related component intended functions during the period of extended operation.

Insert A into page B-162

, with only a general indication that inspection of internal surfaces during the performance of periodic surveillance and maintenance activities has proven effective in maintaining the material condition of plant systems, structures, and components.

Insert B into page B-162

A flexitallic gasket (installed on an FDR pipe flange) was found severely corroded in 2006. The gasket was replaced. No additional instances of corrosion have been documented for the FDR System since then.

This operating experience supports that baseline inspections of each material-environment-aging effect, to determine actual material conditions, prior to the period of extended operation and opportunistic inspections thereafter will, in conjunction with the normal operating experience review process, ensure aging is detected prior to a loss of component intended function.

LRA Amendment 21
Service Air System Inspection Program
Revised Pages

Letter dated November 1st, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML102930593)

LRA Page number	LRA Page number	LRA Page number
3.3-45	B-14	B-184a
A-4	B-18	B-184b
A-24	B-18b	B-185
A-24a	B-24	B-185a
A-60	B-183	B-186
A-60a	B-183a	
B-5	B-184	

- BWR Stress Corrosion Cracking Program
- BWR Water Chemistry Program
- Chemistry Program Effectiveness Inspection
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Flow Accelerated Corrosion (FAC) Program

3.3.2.1.40 Service Air System

Materials

The material of construction for subject mechanical components of the Service Air System is:

- Steel

Environments

Subject mechanical components of the Service Air System are exposed to the following normal operating environments:

- Air
- *Air-indoor uncontrolled*

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Service Air System:

- Loss of material
- Loss of pre-load

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Service Air System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- Service Air System Inspection ← Program

APPENDIX A
TABLE OF CONTENTS

Energy Northwest follows the requirements of the BWRVIP ISP and applies the ISP data to Columbia. The NRC has approved the use of the BWRVIP ISP in place of a unique plant program for Columbia.

The provisions of 10 CFR 50 Appendix G require Columbia to operate within the currently licensed pressure-temperature (P-T) limit curves, and to update these curves as necessary. The P-T limit curves, as contained in plant technical specifications, will be updated as necessary through the period of extended operation as part of the Reactor Vessel Surveillance Program. Reactor vessel P-T limits will thus be managed for the period of extended operation.

A.1.2.47 Selective Leaching Inspection

The Selective Leaching Inspection detects and characterizes the conditions on internal and external surfaces of subject components exposed to raw water, treated water, fuel oil, soil, and moist air (including condensation) environments. The inspection provides direct evidence through a combination of visual examination and hardness testing, or NRC-approved alternative, as to whether, and to what extent, a loss of material due to selective leaching has occurred.

The Selective Leaching Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.48 Service Air System Inspection

Program

Insert B from Page A-24a

~~The Service Air System Inspection detects and characterizes the material condition of steel piping and valve bodies exposed to an "air (internal)" (i.e., compressed air) environment within the license renewal boundary of the Service Air System. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to corrosion has occurred.~~

~~The Service Air System~~ ~~Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.~~

A.1.2.49 Small Bore Class 1 Piping ~~Inspection~~

Program

Insert A from Page A-24a

~~The Small Bore Class 1 Piping Inspection will detect and characterize the conditions on the internal surfaces of small bore Class 1 piping components that are exposed to reactor coolant. The Small Bore Class 1 Piping Inspection will provide physical evidence as to whether, and to what extent, cracking due to SCC or to thermal or mechanical loading has occurred in small bore Class 1 piping components. The Small Bore Class 1 Piping Inspection will also verify, by inspections for cracking, that~~

Insert A to Page A-24

The Small Bore Class 1 Piping Program will detect and characterize cracking of small bore Class 1 piping components that are exposed to reactor coolant. This periodic program will provide physical evidence as to whether, and to what extent, cracking due to SCC or to thermal or mechanical loading has occurred in small bore Class 1 piping components. It will also verify, by inspections for cracking, that reduction of fracture toughness due to thermal embrittlement requires no additional aging management for small Class 1 cast austenitic stainless steel valve bodies. The Small Bore Class 1 Piping Program will be a condition monitoring program with no actions to prevent or mitigate aging effects. The program will include visual and volumetric inspection of a representative sample of small bore Class 1 piping, including butt welds and socket welds.

The Small Bore Class 1 Piping Program is a new program that will be implemented prior to the period of extended operation. Inspection activities will start during the fourth 10-year inservice inspection interval and continue through the period of extended operation. The Small Bore Class 1 Piping Program will credit portions of the Inservice Inspection Program. The Small Bore Class 1 Piping Program will verify the effectiveness of the BWR Water Chemistry Program in mitigating cracking of small bore piping and piping components.

Insert B into page A-24

The Service Air System Inspection Program manages the effect of loss of material due to corrosion of steel piping and valve bodies exposed to an "air (internal)" (i.e., compressed air) environment within the license renewal boundary of the Service Air System.

The Service Air System Inspection Program is a new plant-specific program that will be implemented via baseline inspection of a sample population followed by opportunistic inspections when components are opened for periodic maintenance, repair, or surveillances when surfaces are made available for inspection. These inspections ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
47) Selective Leaching Inspection	The Selective Leaching Inspection is a new activity. The Selective Leaching Inspection detects and characterizes the conditions on internal and external surfaces of subject components exposed to raw water, treated water, fuel oil, soil, and moist air (including condensation) environments. The inspection provides direct evidence through a combination of visual examination and hardness testing, or NRC-approved alternative, as to whether, and to what extent, the relevant effects of aging have occurred.	A.1.2.47	Within the 10-year period prior to the period of extended operation.
48) Service Air System Inspection Program	~~The Service Air System Inspection is a new activity.~~ ~~The Service Air System Inspection detects and characterizes the material condition of steel piping and valve bodies exposed to an "air (internal)" (i.e., compressed air) environment within the license renewal boundary of the Service Air System. The inspection provides direct evidence as to whether, and to what extent, the relevant effects of aging have occurred.~~	A.1.2.48	~~Within the 10-year period prior to the period of extended operation.~~

Replace with Insert A on page A-60a

Replace with Insert B on page A-60a

Insert A into page A-60

The Service Air System Inspection Program is a new program.

The Service Air System Inspection Program manages the effect of loss of material due to corrosion of steel piping and valve bodies exposed to an "air (internal)" (i.e., compressed air) environment within the license renewal boundary of the Service Air System.

The program consists of baseline inspections prior to the period of extended operation followed by opportunistic inspections during the period of extended operation.

Following the baseline inspection, inspection findings will be reviewed periodically to ensure that each material and environment combination has been examined via opportunistic inspection or actions are taken to ensure inspections are performed. Initial interval for review of inspection findings is 5 years and may be adjusted based on operating experience.

Insert B into page A-60

Implementation prior to the period of extended operation and initial inspection within the 10-year period prior to the period of extended operation. Then ongoing.

APPENDIX B

TABLE OF CONTENTS

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program See Section B.2.46.
XI.M32	One-Time Inspection	Chemistry Program Effectiveness Inspection See Section B.2.12. ~~Cooling Units Inspection~~ ~~See Section B.2.14.~~ ~~Diesel Driven Fire Pumps Inspection~~ ~~See Section B.2.18.~~ Diesel Starting Air Inspection See Section B.2.16. ~~Diesel Systems Inspection~~ ~~See Section B.2.17.~~ ~~Flexible Connection Inspection~~ ~~See Section B.2.27.~~ Heat Exchangers Inspection See Section B.2.30. Lubricating Oil Inspection See Section B.2.37. ~~Monitoring and Collection Systems Inspection~~ ~~See Section B.2.41.~~ ~~Service Air System Inspection~~ ~~See Section B.2.48.~~ Supplemental Piping/Tank Inspection See Section B.2.51.
XI.M33	Selective Leaching of Materials	Selective Leaching Inspection See Section B.2.47.
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program See Section B.2.5.
XI.M35	One-time Inspection of ASME Code Class 1 Small-Bore Piping	~~Small Bore Class 1 Piping Inspection~~ See Section B.2.49.
XI.M36	External Surfaces Monitoring	External Surfaces Monitoring Program See Section B.2.23.

Insert A from Page B-14a

Table B-1
Correlation of NUREG-1801 and Columbia Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	High-Voltage Porcelain Insulators Aging Management Program See Section B.2.31.
N/A	Plant-Specific Program	Potable Water Monitoring Program See Section B.2.43.
N/A	Plant-Specific Program	Preventive Maintenance – RCIC Turbine Casing See Section B.2.44.

Insert A from Page B-18a

Insert A from page B-18b after page B-18a from Amendment 2

Insert B from Page B-18b for Amendment 21

Amendment 21

~~Amendment 14~~

~~Amendment 2~~

Insert A to Page B-18

Number	NUREG-1801 Program	Corresponding Columbia AMP
N/A	Plant-Specific Program	Service Level 1 Protective Coatings Program See Section B.2.55.

Insert B to Page B-18

N/A	Plant-Specific Program	Cooling Units Inspection Program See Section B.2.14.
N/A	Plant-Specific Program	Diesel Systems Inspection Program See Section B.2.17.
N/A	Plant-Specific Program	Diesel-Driven Fire Pumps Inspection Program See Section B.2.18.
N/A	Plant-Specific Program	Flexible Connection Inspection Program See Section B.2.27.
N/A	Plant-Specific Program	Monitoring and Collection Systems Inspection Program See Section B.2.41.
N/A	Plant-Specific Program	Service Air System Inspection Program See Section B.2.48.

Table B-2
Consistency of Columbia Aging Management Programs with NUREG-1801
(continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Preventive Maintenance – RCIC Turbine Casing Section B.2.44	Existing	--	--	Yes	--
Reactor Head Closure Studs Program Section B.2.45	Existing	Yes	--	--	--
Reactor Vessel Surveillance Program Section B.2.46	Existing	Yes	--	--	--
Selective Leaching Inspection Section B.2.47	New	Yes	--	--	--
Service Air System Inspection Section B.2.48	New	~~Yes~~	--	--	--
Small Bore Class 1 Piping ~~Inspection~~ Section B.2.49	New	~~Yes~~	--	--	--
Structures Monitoring Program Section B.2.50	Existing	Yes	--	--	Yes
Supplemental Piping/Tank Inspection Section B.2.51	New	Yes	--	--	--

Yes

Program

Program

--

Yes

B.2.48 Service Air System Inspection

Program

plant-specific program for Columbia. The program will consist of inspections

Program Description

The Service Air System Inspection is a new ~~one-time inspection that will detect and characterize the material condition~~ of piping and valve bodies that are within the scope of license renewal in the Service Air System and are exposed to an "Air (internal)" environment. The Service Air System Inspection ~~provides direct evidence as to whether, and to what extent, a loss of material due to general corrosion has occurred or is likely to occur in the subject components that could result in a loss of intended function.~~

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this program

program

Implementation of ~~the Service Air System Inspection~~ will ensure that the pressure boundary integrity of the subject components will be maintained consistent with the current licensing basis during the period of extended operation. Implementation of the ~~inspection~~ will also provide assurance (and confirmation) that the structural integrity of susceptible NSR components will be maintained such that the integrity of the attached safety-related piping is not impacted and will not result in the loss of any safety-related component intended functions during the period of extended operation.

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NUREG-1801 Consistency

~~The Service Air System Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, "One-Time Inspection."~~

Replace with Insert C on page B-183a

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program

~~The Service Air System Inspection detects and characterizes conditions relative to the following subject mechanical components to determine whether, and to what extent, degradation is occurring:~~

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  - Loss of material due to general corrosion on steel piping and valve bodies exposed to an air (internal) environment.

Program

The Service Air System Inspection focuses on the portion of the Service Air System that forms the pressure boundary for containment penetration X93 and the connected piping subject to an air (internal) environment (i.e., compressed air) that

Insert A into page B-183

Program will manage the effect of loss of material due to general corrosion.

The Service Air System Inspection Program will comprise baseline inspections prior to the period of extended operation followed by opportunistic inspections, when components are opened for maintenance, repair, or surveillance, to ensure that the existing environmental conditions in subject Service Air system components are not causing material degradation that could result in a loss of component intended function during the period of extended operation.

Insert B into page B-183

The Service Air System Inspection Program is a new condition-monitoring program. Inspection of a sample population will be conducted within the 10-year period prior to the period of extended operation and will serve as a baseline for future inspections.

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The Service Air System Inspection Program is a new plant-specific program for Columbia for License Renewal. NUREG-1801 includes an Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (XI.M38) that is focused on steel components and the loss of material aging effect. Rather than generating enhancements and exceptions to the NUREG-1801 program, a plant-specific program is developed.

The Service Air System Inspection Program is a new plant-specific program that is evaluated against the ten elements described in Appendix A of the Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, NUREG-1800, Revision 1. The results of an evaluation for each element are described below.

Insert D into page B-183

Prior to the period of extended operation, the Service Air System Inspection Program identifies conditions relative to the following subject mechanical components to determine whether, and to what extent, degradation is occurring and to provide a baseline for future inspections. The program manages the following aging effect of subject components:

Program

performs a structural integrity function. The Service Air System Inspection provides symptomatic evidence of loss of material (due to general corrosion).

- Preventive Actions

The

Program does not include any actions

~~No actions are taken as part of the~~ Service Air System Inspection to prevent aging effects or to mitigate aging degradation.

It is a condition monitoring program.

- Parameters Monitored or Inspected

~~The parameters to be inspected by the Service Air System Inspection include wall thickness or visual evidence of internal surface degradation, as measures of loss of material. Inspections will be performed by qualified personnel using established NDE techniques.~~

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- Detection of Aging Effects

~~The Service Air System Inspection will use a combination of established volumetric (radiographic or ultrasonic testing) and visual (VT-3 or equivalent) examination techniques performed by qualified personnel on a portion of the subject Service Air System components as determined by engineering evaluation, to identify evidence of a loss of material, or to confirm a lack thereof.~~

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~~The sample population will be determined by engineering evaluation based on sound statistical sampling methodology, and, where practical, be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and design margins.~~

~~The Service Air System Inspection will be conducted within the 10 year period prior to the period of extended operation.~~

- Monitoring and Trending

~~This one time inspection activity is used to characterize conditions and determine if, and to what extent, further actions may be required. The activity includes increasing the inspection sample size and location if degradation is detected.~~

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~~Sample size will be determined by engineering evaluation of the materials of construction, environment (i.e., service conditions), aging effects, and operating experience (e.g., time in service, most susceptible locations, lowest design margins). Inspection findings that do not meet the acceptance criteria will be evaluated using the corrective action process to determine the need for subsequent aging management activities and for monitoring and trending of the results.~~

- Acceptance Criteria

~~Indications or relevant conditions of degradation detected during the inspections will be compared to pre determined acceptance criteria. If the acceptance criteria are not met, then the indications and conditions will be evaluated under the corrective~~

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Insert A into page B-184

The parameters to be inspected by the Service Air System Inspection Program include wall thickness or evidence of internal surface degradation, as measures of loss of material.

Inspections will be performed by qualified personnel, primarily visual examination and augmented by other nondestructive examination (NDE) techniques.

Insert B into page B-184

The Service Air System Inspection Program provides for detection of aging effects prior to the loss of component intended function. Inspections will be performed by qualified personnel and will consist of visual examination, supplemented by other nondestructive examination (NDE) techniques, if degradation is observed.

Baseline inspections will be established on a sample population of subject components determined by engineering evaluation to identify evidence of a loss of material prior to the period of extended operation. Opportunistic inspections will be conducted, thereafter, when components are opened for maintenance, repair, or surveillance and surfaces are made available for inspection.

For baseline inspections, the sample population will be 20% of the total population for each material - environment - aging effect group, up to a maximum of 25 inspections per group and, where practical, will be focused on the components most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operation, and the lowest design margins.

Inspection of the sample population will be conducted within the 10-year period prior to the period of extended operation, and will serve as a baseline for future inspections. Any evidence of degradation that could lead to a loss of component intended function will be documented and evaluated through the Columbia corrective action program, including provisions for increasing the inspection sample size and locations.

Insert C into page B-184

The Service Air System Inspection Program comprises baseline inspections prior to the period of extended operation and opportunistic inspections when components are opened for maintenance, repair, or surveillance thereafter. Baseline inspections are used to characterize material conditions and include provisions for increasing the inspection sample size and locations if degradation is detected. The results of baseline inspections are considered to ensure that opportunistic inspections thereafter will detect aging prior to a loss of component intended function.

Sample size for baseline inspections will be determined by engineering evaluation of the materials of construction, environment (i.e., service conditions), aging effects, and operating experience (e.g., time in-service, most susceptible locations, lowest design margins). Inspection findings that do not meet the acceptance criteria will be evaluated using the corrective action program.

Inspection findings will be documented and evaluated by assigned engineering personnel. The inspection findings will be reviewed to ensure that each material has been examined via opportunistic inspection within a 5 year time period. If opportunistic inspections have not occurred within the 5-year interval, appropriate actions will be taken to ensure these inspections are performed. Inspection findings that do not meet the acceptance criteria will be evaluated using the Columbia corrective action program with subsequent adjustments to the program made as necessary.

Insert D into page B-184

Indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria established by engineering evaluation of the pertinent design standard.

Unacceptable inspection findings will include visual evidence of loss of material or reduction in wall thickeness, where appropriate, that could lead to a loss of component intended function during the period of extended operation.

If the acceptance criteria are not met, then the indications and conditions will be evaluated under the Columbia corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation or prior to the next opportunity for inspection.

~~action program to determine whether they could result in a loss of component intended function during the period of extended operation.~~

- Corrective Actions
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  ~~The Service Air System Inspection is a new one time inspection activity for which plant operating experience has not shown the occurrence of the aforementioned aging effect. The activity provides confirmation of conditions where degradation is not expected, has not evidenced as a problem, or where the aging mechanism is slow acting. Due to the fact that portable compressors without dryers have been used in the Service Air System, the system may not have always been reliably dry. This inspection will verify the presence (or absence) of general corrosion within the license renewal boundary of the Service Air System.~~

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  ~~NUREG 1801 is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability; none was identified. Future operating experience is captured through the normal operating experience review process, which will continue through the period of extended operation.~~

  ~~A review of Columbia operating experience to date has identified no instances of loss of material related to the subject components.~~

  ~~The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program is effective in managing the identified aging effects.~~

Required Enhancements

program

Not applicable, this is a new ~~activity~~.

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The Service Air System Inspection Program is a new plant-specific program for which plant operating experience has not shown the occurrence of the aforementioned aging effect. Due to the fact that portable compressors without dryers have been used in the Service Air System, the system may not have always been reliably dry. The ~~inspection~~ Program provides confirmation of material conditions before entering the period of extended operation, and detection of aging effects prior to loss of component intended function during the period of extended operation. The elements comprising the program are to be consistent with industry practice.

NUREG-1801, Revision 1, is based on industry operating experience through January 2005. Recent industry operating experience has been reviewed for applicability, with only a general indication that inspection of internal surfaces during the performance of periodic surveillance and maintenance activities has proven effective in maintaining the material condition of plant systems, structures, and components. Future operating experience is captured through the normal plant operating experience review process, which will continue through the period of extended operation.

This operating experience supports that baseline inspections of each material, to determine actual material conditions, prior to the period of extended operation and opportunistic inspections thereafter will, in conjunction with the normal operating experience review process, ensure aging is detected prior to a loss of component intended function.

The site corrective action program and an ongoing review of industry operating experience will be used to ensure that the program is effective in managing the effects of aging for components within the scope of this program during the period of extended operation.

Conclusion

Program will provide reasonable assurance that the aging effect will be managed such

Implementation of the Service Air System Inspection ~~will verify that there are no aging effects requiring management for the subject components or will identify corrective actions, possibly including programmatic oversight, to be taken to ensure~~ that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation.