ENERGY NORTHWEST

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GO2-11-028

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 October 20, 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)

3) Letter dated January 20, 2011, SK Gambhir (Energy Northwest) to NRC, "Columbia Generating Station, Docket No. 50-397 Response to Request for Additional Information License Renewal Application"

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. Via Reference 3, Energy Northwest stated that a response to RAI B.2.5-2 would be provided under separate letter. This letter provides the response.

Transmitted herewith in the Attachment is the Energy Northwest response to the Request for Additional Information (RAI) contained in Reference 2. The enclosure contains Amendment 25 to the Columbia License Renewal Application. One revised commitment is included in this response.

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

A143
NRR

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

Respectfully,

for
SK Gambhir
Vice President, Engineering

Attachment: Response to Request for Additional Information

Enclosure: License Renewal Application Amendment 25

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. ML102730355)

### RAI B.2.5-2 Buried Pipe Follow-up RAI

### Background

Given that there have been a number of recent industry events involving leakage from buried or underground piping, the staff needs further information to evaluate the impact that these recent industry events might have on the applicant's Buried Piping and Tanks Inspection Program. By letter dated June 30, 2010, the staff issued a request for additional information (RAI) B.2.5-1 requesting that the applicant provide information regarding how Columbia Generating Station (Columbia) will incorporate the recent industry operating experience (OE) into its aging management reviews (AMRs) and aging management programs (AMPs). The applicant responded on August 26, 2010. In reviewing the response, the staff had further questions.

### Issue

1) The license renewal application (LRA) states that circulating water, diesel fuel oil, fire protection, radwaste building HVAC, standby service water, tower make-up water, and condensate nuclear systems include in-scope buried piping. The applicant's response did not provide specifics on the number of buried or underground pipe and tank inspections that would be conducted. The staff believes that in order to provide a reasonable assurance that in-scope buried piping and tanks will be capable of performing its current license basis (clb) function(s) and not release hazardous materials (Le., material which, if released, could be detrimental to the environment such as diesel fuel and radioisotopes that exceed the Environmental Protection Agency drinking water standards) to the environment, each category of in-scope buried piping based on material, safety/Code class, and potential to contain hazardous material should be inspected. The LRA and supplemental material did not contain enough specifics on the planned inspections for the staff to determine if the inspections would be adequate to manage the aging effect for in-scope buried pipes and tanks based on material, safety/Code class, and potential to contain hazardous material categories.

2) The applicant's response did not state if they would utilize examination methods other than excavation and direct visual inspection of buried piping. The staff acknowledges that examining buried pipe from the exterior surface may not be possible sometimes due to plant configuration (e.g., the piping is located underneath foundations); nevertheless, it is important to expose a large enough length of the piping in order to establish reasonable assurance of the condition of the piping system. The staff believes that in instances where it is not possible to

examine the program designated length of piping during each inspection, an alternative examination should be proposed. For example, the staff notes that it is reasonable to substitute an ultrasonic volumetric examination from the interior of the pipe provided the surface is properly prepared.

3) The LRA does not contain details on (a) which in-scope buried piping systems are protected by a cathodic protection system, (b) the availability of the cathodic protection system, and (c) what periodic testing is conducted on the cathodic protection system. The staff's position is that cathodic protection is an important preventive measure for steel piping.

4) Neither the LRA nor the RAI response described the quality of the backfill in the vicinity of buried in-scope piping. The presence of rocks and sharp objects in the backfill around buried pipes is a leading precursor of degradation of buried piping. Over time ground movement causes these materials to come in contact with the buried pipe resulting in damage to the pipe's coating or external surfaces. Also, based on the staff's review of LRA Section 2.3, the Updated Final Safety Analysis Report (UFSAR) and the License Renewal boundary Drawings, it is not clear to the staff if the in-scope buried piping for the radwaste building HVAC has a safety related function.

**Request**

1) For buried in-scope piping and tanks, respond to the following:

   i. Understanding that the total number of inspections performed will be dictated by plant-specific and industry operating experience, what minimum number of inspections of buried in-scope piping are planned during the 30 -40 year, 40 -50 year, and 50 -60 year operating period? When defining the minimum number of planned inspections, categorize the buried in-scope piping inspection quantities into material, code/safety-related piping, and potential to contain hazardous material.

   ii. As part of the planned inspections, what lengths of piping will be excavated and have a direct visual inspection?

   iii. While it is clear to the staff that the diesel fuel oil piping contains hazmat material, the staff does not have sufficient information to determine if the Circulating water, fire protection, radwaste building HVAC, standby service water, tower make-up water, and condensate nuclear systems contain hazmat. Which of these systems contain hazmat during normal operation?

   iv. For in-scope buried piping containing hazmat, what percent of total linear feet will be inspected during each ten year period, beginning at a time period, ten years prior to the period of extended operation?

v. If there are no planned inspections for in-scope buried piping containing hazmat, justify why it is acceptable to not inspect in-scope buried piping containing hazardous materials.

vi. How many inspections will be conducted for the buried diesel fuel oil storage tanks during the 30 -40 year, 40 -50 year, and 50 -60 year operating period? If each tank will not be inspected at least once during the 30 -60 year operating period, justify why any lesser number of inspections will be effective at providing a reasonable assurance that the buried in-scope tanks will meet their current licensing basis function.

2) For buried in-scope piping respond to the following:

i. If excavated direct visual inspections of buried pipe are not possible, describe what alternative inspection methods will be utilized.

ii. Justify why alternative volumetric examination method, beyond ultrasonic examinations, will be effective at providing a reasonable assurance that the buried in-scope piping system will meet their CLB function, if it is used to conduct an interior wall thickness as an alternative for excavating and visually inspecting a buried piping segment.

iii. If a volumetric examination method is used in lieu of direct visual examination, what percentage of interior axial length of the pipe will be inspected?

3) For buried in-scope steel piping respond to the following:

i. Which piping systems are cathodically protected? Include portions of a system that are cathodically protected, and portions of a system that are not cathodically protected.

ii. If a piping system or portions of a system are not cathodically protected:

a. Justify how the piping will meet or exceed the minimum design wall thickness throughout the period of extended operation.

b. State what augmented inspections will be conducted. If no augmented inspections are planned, justify how a reasonable assurance will be established that the piping will meet its CLB throughout the period of extended operation.

iii. State the availability of the cathodic protection system. If portions of the system are not available 90% of the time or allowed to be out of service for greater than 90 days in any given year, justify how the piping will meet or exceed the minimum design wall thickness throughout the period of extended operation.

iv. If annual ground potential surveys of the cathodic protection system are conducted, what is the acceptance criteria. If annual ground potential surveys are not conducted, justify how the piping will meet or exceed the minimum design wall thickness throughout the period of extended operation.

4) For buried in-scope piping respond to the following:

i. Describe and provide details on the quality of the backfill in the vicinity of in-scope buried pipes.

a. If there is no information on the condition of the quality of backfill beyond initial installation specifications (i.e., no documented observations of the quality of the backfill), justify why the planned inspections are adequate to detect potential degradation as a result of coating damage or holidays, or damage to the exterior surface of non-coated piping.

5) State if the in-scope buried piping for the radwaste building HVAC has a safety related function.

**Energy Northwest Response:**

As described in License Renewal Application (LRA) Appendix B.2.5, Columbia's Buried Piping and Tanks Inspection Program, with enhancement (to include piping from an additional system and to include inspection of a representative sample of buried pipe prior to the period of extended operation and in the first ten (10) years after entering that period), is consistent with an effective aging management program described in NUREG-1801, Rev. 1, Section XI.M34.

The Buried Piping and Tanks Inspection Program was revised in Amendment 1, during the first annual update of the LRA, to include stainless steel piping components and closure bolting that are buried and exposed to soil. The Buried Piping and Tanks Inspection Program was further revised in Amendment 15 to clarify that the program also includes an inspection of the steel pipe from the Condensate Storage Tanks (CSTs) that is enclosed in a guard pipe and buried, consistent with plant-specific note 0408 in LRA Section 3.4.2.

As stated in Energy-Northwest Letter GO2-10-124, the Buried Piping and Tanks Inspection Program will use industry and plant specific operating experience (OE), in addition to trending of past inspections, to drive inspection locations for piping that is buried. This includes piping that may run within a vault or culvert; however it does not include piping within buildings below grade (such as Reactor Building basement).

Recent industry operating experience for buried and below grade piping has been summarized in NUREG-1801, Rev. 2, Section XI.M41.

To incorporate this industry operating experience, Energy-Northwest has updated the Buried Piping and Tanks Inspection Program for CGS as shown in the attached LRA

Amendment 25. In addition, the enhancement to include the Radwaste Building Outside Air (WOA), Control Room outside air intake, piping in the scope of program is deleted as shown in attached LRA Amendment 25, as it was added to the program scope following submittal of the application.

Responses to the specific requests for additional information below are from the perspective of this updated aging management program.

1) For buried in-scope piping and tanks –

i) Planned inspections of buried piping, piping components and buried tanks within the scope of license renewal for Columbia will be performed as a minimum per the following table:

| Planned Inspections of Buried Piping, Piping Components and Buried Tanks within the Scope of License Renewal for Columbia | | |
|---|---|---|
| **Material** | **Number or Percentage of Inspections (per 10-Year interval; 30-40, 40-50 and 50-60)** | |
| | **Code-Class/Safety-Related/Other** | **Hazmat** |
| Polymer | 1 | -- |
| Concrete | 1 | -- |
| Stainless Steel | 1 | -- |
| Steel | 1 | 2% |
| Steel Tank | 1 | -- |

The inspections in the 10-year interval prior to the period of extended operation (year 30 to end of year 40) will serve as a baseline for the conditions of buried piping and components at CGS.

ii) Buried piping will be excavated for direct visual inspection, either focused or opportunistic. Each inspection will examine either the entire length of a run of pipe or a minimum of 10 feet. If the number of inspections times the minimum inspection length (10 feet) exceeds 10% of the length of the piping under consideration, only 10% need be inspected. If the total length of in-scope pipe constructed of a given material times the percentage to be inspected is less than 10 feet, either 10 feet or the total length of pipe present, whichever

is less, will be inspected. Code Class and safety-related pipe that also meets the definition of hazmat pipe will be inspected as hazmat pipe.

iii) Condensate Nuclear (COND) piping from the CST is considered to contain hazardous materials during normal plant operation. The system is designed to provide makeup water to the spent fuel pool and to receive and accommodate a surge volume for condensate returned to the storage tanks after treatment in the liquid radwaste system. This water (e.g., used during refueling operations) that is returned to the CST may be contaminated.

iv) As described in the table for item i) above, 2% of the total linear feet of in-scope buried hazmat piping (containing hazardous materials) will be inspected prior to the period of extended operation and in each 10-year interval of the period of extended operation.

v) Not applicable, see response to item iv) above.

vi) As described in the table for item i) above, one inspection of the steel buried diesel fuel oil storage tanks will be conducted during the 10-year interval prior to the period of extended operation and in each 10-year interval of the period of extended operation.

These examinations may be conducted from the external surface using visual techniques or from the internal surface of the tank using volumetric techniques. There are three tanks that are buried and in the scope of license renewal. These tanks are shown on boundary drawing LR-M512-4 and listed in LRA Table 3.3.2-18, row number 67. The material for all of the fuel oil storage tanks is steel. The tanks are buried in Class 1 backfill beneath the Diesel Generator Building. As described in the response to RAI B.2.5-1, buried tanks are subject to periodic ultrasonic examinations. Deficiencies found during these inspections will be entered into the corrective action process and resolved accordingly. As such, inspection as described will be effective at providing a reasonable assurance that the three buried in-scope tanks will meet their current licensing basis function.

2) For buried in-scope piping –

i) Excavated direct visual inspections of buried pipe, either opportunistic or focused, are planned. As such, no alternative inspection methods are planned.

ii) Not applicable, alternate volumetric examination methods are not used to conduct interior wall thickness measurements as an alternative for excavating and visually inspecting a buried pipe segment.

iii) Volumetric examination methods will be used for buried piping as a supplement to visual inspection if significant indications are observed during

visual inspection. Volumetric examinations in lieu of visual inspection are not credited as part of the Buried Piping and Tanks Inspection Program, except for buried tanks.

3) For buried in-scope steel piping –

i) Underground and buried piping at Columbia are cathodically protected, as clarified below.

Cathodic protection, in accordance with NACE SP0169-2007 and SP0572-2007, is provided via deepwell anode beds or distributed anode configuration for buried metallic piping and components in locations determined by a site soil corrosivity assessment. The equipment used to implement cathodic protection for Columbia is not qualified in accordance with 10 CFR 50 Appendix B. However, the system is operated so that NACE SP0169-2007 criteria and considerations are met at the pertinent locations in the systems. The rectifier voltage and current samples are checked every three months, unless justified otherwise, and pipe to soil voltage measurements taken once a year.

The following systems that are buried and within the scope of license renewal for Columbia are provided with cathodic protection:

- Circulating Water System (CW),
- Condensate Nuclear System (COND),
- Fire Protection System (FP),
- Standby Service Water System (SW), and
- Tower Makeup Water System (TMU).

The Buried Piping and Tanks Inspection Program, described in LRA Amendment 25, includes an enhancement prior to the period of extended operation to:

- Include confirmation (prior to the period of extended operation) that all portions of piping that is buried, except for the Diesel Fuel Oil System, and in the scope of license renewal are provided with cathodic protection through the period of extended operation,

The buried piping and components in the Diesel Fuel Oil System (DO) that are in the scope of license renewal for Columbia do not receive cathodic protection as described in response to item ii) below. Also, cathodic protection of Radwaste Building HVAC System (WOA) could not be confirmed.

ii) Buried piping and components in the scope of license renewal for the Columbia DO System are not cathodically protected. However, they will

perform their intended function consistent with the current licensing basis (CLB) throughout the period of extended operation based on the following considerations that provide reasonable assurance:

- DO - As described in FSAR Section 9.5.4.3, regarding Diesel Generator fuel oil piping and tanks, "The overflow lines from the day tank to the storage tank run underground south of the diesel generator building. Diesel oil pipe lines extending under the diesel generator building do not receive full protection from the exterior rectifier-anode system because of the electrical shielding effect of the ground grid and foundation reinforcing and structural steel. Since the earth area under the diesel generator building is sheltered and hence relatively much drier than the earth exterior to this building, no additional cathodic protection system is provided or required."

  FSAR Section 9.5.4.3 further indicates that the exterior surfaces of the buried piping and components in the diesel oil supply system are coated with coal tar enamel. Application of coatings is in strict accordance with AWWA Specification C203.

  Furthermore, as described for item 1.iv) above, at least 2% of the total linear feet of in-scope buried hazmat piping (containing hazardous materials) will be inspected prior to the period of extended operation and in each 10-year interval of the period of extended operation.

  The corrosion protection provisions for the diesel oil piping and components described in the CLB and inspections of hazmat piping planned as part of the Buried Piping and Tanks Inspection Program provide reasonable assurance that the DO piping and components will continue to perform their intended function consistent with the CLB through the period of extended operation.

- WOA – As listed in LRA Table 3.3.2-36, the portions of the Radwaste Building HVAC Systems that are in the scope of license renewal and buried, exposed to a "Soil (External)" environment, include steel piping in the Control Room Outside Air (WOA) System. As shown on boundary drawing LR-M548-1, Coordinates K14 and K5-6, the remote intakes and associated piping for Control Room Units WMA-AH-51A & 51B are located at grade level.

  The below ground piping contains outside air from the remote intakes, one of which is located southeast of the Diesel Generator Building. The steel piping is wrapped, which is the same as other steel piping that is buried. The buried WOA piping is in the vicinity of piping zone (rectifier zone) 10, but cathodic protection of all portions could not be confirmed. As described in response to item 3.i) above, the Buried Piping and Tanks Inspection Program described in LRA Amendment 25 includes an

enhancement to confirm that all portions of piping that are buried and in the scope of license renewal, except for Diesel Fuel Oil System, are provided with cathodic protection through the period of extended operation.

Therefore, no augmented inspections of buried DO or WOA piping will be conducted.

iii) The cathodic protection system was upgraded following a 2006 site assessment of soil corrosivity. This assessment determined those locations that required continued cathodic protection in the relatively mild, Columbia Generating Station soil. However, site experience has shown that portions of the nonsafety-related cathodic protection system may be unavailable for at least 10% of the time, or allowed to be out of service or to deviate from criteria for greater than 90 days in any given year up to and during the period of extended operation.

As such, inspections are selected for each buried material during the 10-year intervals prior to, and through, the period of extended operation that rely on the coatings and backfill preventive actions, but recognize that the nonsafety-related cathodic protection may not be operational for all portions of the system 90% of the time between inspections conducted under the Buried Piping And Tanks Inspection Program during the period of extended operation, or may be out of service or deviate from criteria for greater than 90 days.

This is consistent with NUREG-1801, Rev. 2. Note 2.D of Table 4a in NUREG-1801, Section XI.M41 indicates for buried pipe that "External corrosion control is provided in accordance with NACE SP0169-2007. Each cathodic protection system (a) was installed less than 5 years prior to the period of extended operation or was operational for less than 90% of the time during that 5-year period or (b) was operational for less than 90% of the time since the last inspection conducted under this program."

NUREG-1801, Rev. 2 Note 2.E of Table 4a and Table 4c indicates for buried piping and tanks, respectively, that "Coatings and backfill are in accordance with Table 2a of this AMP, but cathodic protection is not provided or is not consistent with criteria C or D. This category is provided for use during the 10 years prior to the period of extended operation by applicants who are not able to install cathodic protection in accordance with program element 2 prior to entry into the period of extended operation. Following entry into the period of extended operation, consistency with program element 2 or an approved alternative is expected."

The Buried Piping and Tanks Inspection Program in LRA Amendment 25 includes a commitment to upgrade cathodic protection for all buried piping

and components that are in the scope of license renewal, except DO, prior to the period of extended operation to:

1. ensure that cathodic protection is operational at least 90% of the time between inspections during the period of extended operation.
2. ensure that the duration of deviations from cathodic protection criteria do not exceed 90 days.

iv) Pipe to soil voltage measurements are conducted once a year, with NACE acceptance criteria of -0.85 VDC shift.

4) For buried in-scope piping, soil excavation, backfill and compaction are controlled in accordance with standard industry practices. Backfill material that has been placed in accordance with plant procedure and specification is expected to be acceptable with regards to degradation of buried coatings, and to meet the objectives of NACE SP0169-2007. Overall, the quality of the backfill is regulated by the gradation of the soil material used as backfill. Additionally, the procedure requires that all backfill material be free of trash, roots, organic, frozen or other unsuitable material and bedding material (sand) be provided around pipes. Backfill material at Columbia is granular soil that is a size less restrictive than ASTM D 448-08 size number 67. Also, bedding material at Columbia is less restrictive than ASTM D 448-08 size number 10 and is only required to cover buried pipe up to 3 inches. As such, confirmation of the quality of the backfill will be included in the visual inspections described above.

   Flowable backfill material (controlled low strength material) is not used at Columbia.

   As such, planned inspections are adequate to detect potential degradation as a result of coating damage or holidays. As per Columbia design specifications all buried metallic piping and tanks are provided with protective coatings.

5) The in-scope buried piping for the Radwaste Building HVAC systems, that is the Radwaste Building Outside Air (WOA) System, has a safety-related function.

   As stated in the Safety Evaluation for the Main Control Room HVAC, FSAR Section 9.4.1.3, "Each remote air intake header is provided with redundant radiation monitors to alarm in the event of high radiation. ...One remote intake will always remain open to ensure a pressurized control room and prevent infiltration. The remote fresh air intakes are used to pressurize the main control room through emergency filter units. This limits infiltration of airborne radioactive contaminants and smoke due to a fire within the plant but external to the control room."

   As shown on boundary drawing LR-M548-1, outside air from remote intakes *at grade level* is provided to the Control Room Air Handling Units (WMA-AH-51A & 51/B) via 12"WOA(51A)-1 and 12"WOA(51B)-1. As described in LRA Section 2.3.3.37, the Radwaste Building HVAC Systems provide outside air intakes to the Radwaste Building ESF (engineered safety features) HVAC system, a safety-related system-intended function.

# License Renewal Application
# Amendment 25

| LRA Section Number | Page Number | RAI Number |
|---|---|---|
| Table 3.3.1 | 3.3-66 | B.2.5-2 |
| Table 3.3.2-1 | 3.3-118 | B.2.5-2 |
| Table 3.3.2-1 | 3.3-119 | B.2.5-2 |
| Table 3.3.2-18 | 3.3-210 | B.2.5-2 |
| Table 3.3.2-18 | 3.3-211 | B.2.5-2 |
| Table 3.3.2-18 | 3.3-214 | B.2.5-2 |
| Table 3.3.2-18 | 3.3-215 | B.2.5-2 |
| Table 3.3.2-22 | 3.3-242 | B.2.5-2 |
| Table 3.3.2-22 | 3.3-243 | B.2.5-2 |
| Table 3.3.2-22 | 3.3-244 | B.2.5-2 |
| Table 3.3.2-22 | 3.3-255 | B.2.5-2 |
| Table 3.3.2-22 | 3.3-256 | B.2.5-2 |
| Table 3.3.2-36 | 3.3-328 | B.2.5-2 |
| Table 3.3.2-36 | 3.3-328c | B.2.5-2 |
| Table 3.3.2-42 | 3.3-383 | B.2.5-2 |
| Table 3.3.2-42 | 3.3-384 | B.2.5-2 |
| Table 3.3.2-42 | 3.3-389 | B.2.5-2 |
| Table 3.3.2-42 | 3.3-390 | B.2.5-2 |
| Table 3.3.2-43 | 3.3-392 | B.2.5-2 |
| Table 3.3.2-43 | 3.3-394 | B.2.5-2 |

| | | |
|---|---|---|
| Table 3.3.2-43 | 3.3-395 | B.2.5-2 |
| Note 0330 and 0331 | 3.3-400a | B.2.5-2 |
| A.1.2.5 | A-9 | B.2.5-2 |
| A.1.2.5 | A-9a | B.2.5-2 |
| A.1.2.5 | A-9b | B.2.5-2 |
| Table A-1 | A-43 | B.2.5-2 |
| Table A-1 | A-43a | B.2.5-2 |
| Table A-1 | A-43b | B.2.5-2 |
| Table A-1 | A-43c | B.2.5-2 |
| Table A-1 | A-43d | B.2.5-2 |
| Table A-1 | A-43e | B.2.5-2 |
| Table B-2 | B-19 | B.2.5-2 |
| B.2.5 | B-39 | B.2.5-2 |
| B.2.5 | B-39a | B.2.5-2 |
| B.2.5 | B-39b | B.2.5-2 |
| B.2.5 | B-39c | B.2.5-2 |
| B.2.5 | B-39d | B.2.5-2 |
| B.2.5 | B-39e | B.2.5-2 |
| B.2.5 | B-39f | B.2.5-2 |
| B.2.5 | B-39g | B.2.5-2 |
| B.2.5 | B-39h | B.2.5-2 |
| B.2.5 | B-39i | B.2.5-2 |
| B.2.5 | B-39j | B.2.5-2 |

| | | |
|---|---|---|
| B.2.5 | B-39k | B.2.5-2 |
| B.2.5 | B-39l | B.2.5-2 |
| B.2.5 | B-39m | B.2.5-2 |
| B.2.5 | B-40 | B.2.5-2 |
| B.2.5 | B-40a | B.2.5-2 |
| B.2.5 | B-40b | B.2.5-2 |
| B.2.23 | B-101 | B.2.5-2 |
| B.2.23 | B-101a | B.2.5-2 |

**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 |
|---|---|---|---|---|---|
| 3.3.1-19 | Steel (with or without coating or wrapping) piping, piping components, and piping elements exposed to soil | Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion | Buried Piping and Tanks Surveillance<br><br>Or<br><br>Buried Piping and Tanks Inspection | No<br><br>Yes, detection of aging effects and operating experience are to be further evaluated | Not applicable.<br><br>The Buried Piping and Tanks Surveillance is not credited to provide aging management.<br><br>Consistent with NUREG-1801<br><br>The Buried Piping and Tanks Inspection Program is credited to manage loss of material for steel piping (with or without coating or wrapping), piping components, and piping elements in the auxiliary systems that are exposed to soil.<br><br>This item is also applied to the steel diesel fuel oil storage tank.<br><br>Refer to Section 3.3.2.2.8 for further information. |

Insert "with an exception that applies only to buried piping and components in the Diesel Fuel Oil System"

**Table 3.3.2-1 Aging Management Review Results – Circulating Water System**

| Row No. | Component Type | Intended Function(s) | Material | Environment | Aging Effect Requiring Management | Aging Management Program | NUREG-1801 Volume 2 Item | Table 1 Item | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Bolting | Pressure boundary | Steel | Air-outdoor (External) | Loss of material | Bolting Integrity | VII.I-1 | 3.3.1-43 | B |
| 2 | Bolting | Pressure boundary | Steel | Air-outdoor (External) | Loss of pre-load | Bolting Integrity | N/A | N/A | H |
| 3 | Piping | Pressure boundary | Concrete | Raw water (Internal) | None | None | N/A | N/A | G |
| 4 | Piping | Pressure boundary | Concrete | Soil (External) | None | ~~None~~ Buried Piping and Tanks Inspection | II.B1.2-1 | 3.5.1-2 | I 0301 |
| 5 | Piping | Pressure boundary | Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 6 | Piping | Pressure boundary | Steel | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |
| 7 | Piping | Pressure boundary | Steel | Soil (External) | Loss of material | Buried Piping and Tanks Inspection | VII.C1-18 | 3.3.1-19 | A |
| ~~8~~ | ~~Rupture Disc~~ | ~~Pressure boundary~~ | ~~Stainless Steel~~ | ~~Raw water (Internal)~~ | ~~Loss of material~~ | ~~Open-Cycle Cooling Water~~ | ~~VII.C1-15~~ | ~~3.3.1-79~~ | ~~B~~ |
| ~~9~~ | ~~Rupture Disc~~ | ~~Pressure boundary~~ | ~~Stainless Steel~~ | ~~Raw water (External)~~ | ~~Loss of material~~ | ~~Open-Cycle Cooling Water~~ | ~~VII.C1-15~~ | ~~3.3.1-79~~ | ~~B~~ |

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Delete rows 8 and 9

Buried Piping and Tanks Inspection



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**Table 3.3.2-1 Aging Management Review Results – Circulating Water System**

| Row No. | Component Type | Intended Function(s) | Material | Environment | Aging Effect Requiring Management | Aging Management Program | NUREG-1801 Volume 2 Item | Table 1 Item | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 10 | Valve Body | Pressure boundary | Gray Cast Iron | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 11 | Valve Body | Pressure boundary | Gray Cast Iron | Raw water (Internal) | Loss of material | Selective Leaching Inspection | VII.C1-11 | 3.3.1-85 | A |
| 12 | Valve Body | Pressure boundary | Gray Cast Iron | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |
| 13 | Valve Body | Pressure boundary | Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 14 | Valve Body | Pressure boundary | Steel | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |

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Insert new rows 15 through 21 for Table 3.3.2-1 as shown on page 3.3-119a

**Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System**

| Row No. | Component Type | Intended Function(s) | Material | Environment | Aging Effect Requiring Management | Aging Management Program | NUREG-1801 Volume 2 Item | Table 1 Item | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 28 | Orifice | Throttling | Stainless Steel | Fuel oil (Internal) | Loss of material | Fuel Oil Chemistry | VII.H1-6 | 3.3.1-32 | B |
| 29 | Piping | Pressure boundary | Steel | Air-outdoor (Internal) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | C 0324 |
| 30 | Piping | Pressure boundary | Steel | Fuel oil (Internal) | Loss of material | Chemistry Program Effectiveness Inspection | VII.H1-10 | 3.3.1-20 | A |
| 31 | Piping | Pressure boundary | Steel | Fuel oil (Internal) | Loss of material | Fuel Oil Chemistry | VII.H1-10 | 3.3.1-20 | B |
| 32 | Piping | Pressure boundary | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A 0331 |
| 33 | Piping | Pressure boundary | Steel | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |
| 34 | Piping | Pressure boundary | Steel | Concrete (External) | None | None | VII.J-21 | 3.3.1-96 | A |
| 35 | Piping | Pressure boundary | Steel | Soil (External) | Loss of material | Buried Piping and Tanks Inspection | VII.H1-9 | 3.3.1-19 | A B |
| 36 | Piping | Structural integrity | Steel | Air-outdoor (Internal) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | C 0324 |

**Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System**

| Row No. | Component Type | Intended Function(s) | Material | Environment | Aging Effect Requiring Management | Aging Management Program | NUREG-1801 Volume 2 Item | Table 1 Item | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 37 | Piping | Structural integrity | Steel | Fuel oil (Internal) | Loss of material | Chemistry Program Effectiveness Inspection | VII.H1-10 | 3.3.1-20 | A |
| 38 | Piping | Structural integrity | Steel | Fuel oil (Internal) | Loss of material | Fuel Oil Chemistry | VII.H1-10 | 3.3.1-20 | B |
| 39 | Piping | Structural integrity | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |
| 40 | Piping | Structural integrity | Steel | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |
| 41 | Piping | Structural integrity | Steel | Concrete (External) | None | None | VII.J-21 | 3.3.1-96 | A |
| 42 | Piping | Structural integrity | Steel | Soil (External) | Loss of material | Buried Piping and Tanks Inspection | VII.H1-9 | 3.3.1-19 | ~~A~~ |
| 43 | Pump Casing (DO-P-1A,1B,2) | Pressure boundary | Stainless Steel | Fuel oil (Internal) | Loss of material | Chemistry Program Effectiveness Inspection | VII.H1-6 | 3.3.1-32 | A |
| 44 | Pump Casing (DO-P-1A,1B,2) | Pressure boundary | Stainless Steel | Fuel oil (Internal) | Loss of material | Fuel Oil Chemistry | VII.H1-6 | 3.3.1-32 | B |
| 45 | Pump Casing (DO-P-1A,1B,2) | Pressure boundary | Stainless Steel | Air-indoor uncontrolled (External) | None | None | VII.J-15 | 3.3.1-94 | A |

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B

| Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Row No.** | **Component Type** | **Intended Function(s)** | **Material** | **Environment** | **Aging Effect Requiring Management** | **Aging Management Program** | **NUREG-1801 Volume 2 Item** | **Table 1 Item** | **Notes** |
| 64 | Tank (DO-TK-1A,1B,2) | Pressure boundary | Steel | Fuel oil (Internal) | Loss of material | Chemistry Program Effectiveness Inspection | VII.H1-10 | 3.3.1-20 | A |
| 65 | Tank (DO-TK-1A,1B,2) | Pressure boundary | Steel | Fuel oil (Internal) | Loss of material | Fuel Oil Chemistry | VII.H1-10 | 3.3.1-20 | B |
| 66 | Tank (DO-TK-1A,1B,2) | Pressure boundary | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |
| 67 | Tank (DO-TK-1A,1B,2) | Pressure boundary | Steel | Soil (External) | Loss of material | Buried Piping and Tanks Inspection | VII.H1-9 | 3.3.1-19 | A B |
| 68 | Tank (DO-TK-3A,3B,3C) | Pressure boundary | Steel | Air-outdoor (Internal) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | C 0324 |
| 69 | Tank (DO-TK-3A,3B,3C) | Pressure boundary | Steel | Fuel oil (Internal) | Loss of material | Chemistry Program Effectiveness Inspection | VII.H1-10 | 3.3.1-20 | A |
| 70 | Tank (DO-TK-3A,3B,3C) | Pressure boundary | Steel | Fuel oil (Internal) | Loss of material | Fuel Oil Chemistry | VII.H1-10 | 3.3.1-20 | B |
| 71 | Tank (DO-TK-3A,3B,3C) | Pressure boundary | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |
| 72 | Tubing | Pressure boundary | Stainless Steel | Fuel oil (Internal) | Loss of material | Chemistry Program Effectiveness Inspection | VII.H1-6 | 3.3.1-32 | A |

| Table 3.3.2-18 Aging Management Review Results – Diesel Fuel Oil System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Row No.** | **Component Type** | **Intended Function(s)** | **Material** | **Environment** | **Aging Effect Requiring Management** | **Aging Management Program** | **NUREG-1801 Volume 2 Item** | **Table 1 Item** | **Notes** |
| 73 | Tubing | Pressure boundary | Stainless Steel | Fuel oil (Internal) | Loss of material | Fuel Oil Chemistry | VII.H1-6 | 3.3.1-32 | B |
| 74 | Tubing | Pressure boundary | Stainless Steel | Air-indoor uncontrolled (External) | None | None | VII.J-15 | 3.3.1-94 | A |
| 75 | Valve Body | Pressure boundary | Steel | Fuel oil (Internal) | Loss of material | Chemistry Program Effectiveness Inspection | VII.H1-10 | 3.3.1-20 | A |
| 76 | Valve Body | Pressure boundary | Steel | Fuel oil (Internal) | Loss of material | Fuel Oil Chemistry | VII.H1-10 | 3.3.1-20 | B |
| 77 | Valve Body | Pressure boundary | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |
| 78 | Valve Body | Structural integrity | Steel | Fuel oil (Internal) | Loss of material | Chemistry Program Effectiveness Inspection | VII.H1-10 | 3.3.1-20 | A |
| 79 | Valve Body | Structural integrity | Steel | Fuel oil (Internal) | Loss of material | Fuel Oil Chemistry | VII.H1-10 | 3.3.1-20 | B |
| 80 | Valve Body | Structural integrity | Steel | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |

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Insert new rows 81 through 86 for Table 3.3.2-18 as shown on page 3.3-215a

| Table 3.3.2-22 Aging Management Review Results –Fire Protection System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Row No.** | **Component Type** | **Intended Function(s)** | **Material** | **Environment** | **Aging Effect Requiring Management** | **Aging Management Program** | **NUREG-1801 Volume 2 Item** | **Table 1 Item** | **Notes** |
| 65 | Orifice | Pressure boundary | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |
| 66 | Orifice | Throttling | Stainless Steel | Raw water (Internal) | Loss of material | Fire Water | VII.G-19 | 3.3.1-69 | A |
| 67 | Orifice | Throttling | Steel | Air-indoor uncontrolled (Internal) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | C 0302 |
| 68 | Piping | Pressure boundary | Gray Cast Iron | Air-indoor uncontrolled (Internal) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | C 0302 |
| 69 | Piping | Pressure boundary | Gray Cast Iron | Raw water (Internal) | Loss of material | Fire Water | VII.G-24 | 3.3.1-68 | A |
| 70 | Piping | Pressure boundary | Gray Cast Iron | Raw water (Internal) | Loss of material | Selective Leaching Inspection | VII.G-14 | 3.3.1-85 | A |
| 71 | Piping | Pressure boundary | Gray Cast Iron | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |
| 72 | Piping | Pressure boundary | Gray Cast Iron | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |

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**Table 3.3.2-22 Aging Management Review Results –Fire Protection System**

| Row No. | Component Type | Intended Function(s) | Material | Environment | Aging Effect Requiring Management | Aging Management Program | NUREG-1801 Volume 2 Item | Table 1 Item | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 73 | Piping | Pressure boundary | Gray Cast Iron | Soil (External) | Loss of material | Buried Piping and Tanks Inspection | VII.G-25 | 3.3.1-19 | A |
| 74 | Piping | Pressure boundary | Gray Cast Iron | Soil (External) | Loss of material | Selective Leaching Inspection | VII.G-15 | 3.3.1-85 | A |
| 75 | Piping | Pressure boundary | Polymer | Raw water (Internal) | None | None | N/A | N/A | F |
| 76 | Piping | Pressure boundary | Polymer | Soil (External) | None | ~~None~~ Buried Piping and Tanks Inspection | N/A | N/A | F 0330 |
| 77 | Piping | Pressure boundary | Stainless Steel | Raw water (Internal) | Loss of material | Fire Water | VII.G-19 | 3.3.1-69 | A |
| 78 | Piping | Pressure boundary | Stainless Steel | Air-indoor uncontrolled (External) | None | None | VII.J-15 | 3.3.1-94 | A |
| 79 | Piping | Pressure boundary | Steel | Air-indoor uncontrolled (Internal) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | C 0302 |
| 80 | Piping | Pressure boundary | Steel | Air-outdoor (Internal) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | C 0324 |

| Table 3.3.2-22 Aging Management Review Results –Fire Protection System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Row No.** | **Component Type** | **Intended Function(s)** | **Material** | **Environment** | **Aging Effect Requiring Management** | **Aging Management Program** | **NUREG-1801 Volume 2 Item** | **Table 1 Item** | **Notes** |
| 81 | Piping | Pressure boundary | Steel | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |
| 82 | Piping (exhaust) | Pressure boundary | Steel | Air-outdoor (Internal) | Loss of material | Diesel-Driven Fire Pumps Inspection | VII.H2-2 | 3.3.1-18 | E 0322 |
| 83 | Piping | Pressure boundary | Steel | Fuel oil (Internal) | Loss of material | Fire Protection | VII.G-21 | 3.3.1-64 | B |
| 84 | Piping | Pressure boundary | Steel | Fuel oil (Internal) | Loss of material | Fuel Oil Chemistry | VII.G-21 | 3.3.1-64 | B |
| 85 | Piping | Pressure boundary | Steel | Lubricating oil (Internal) | Loss of material | Lubricating Oil Analysis | VII.G-22 | 3.3.1-14 | A |
| 86 | Piping | Pressure boundary | Steel | Lubricating oil (Internal) | Loss of material | Lubricating Oil Inspection | VII.G-22 | 3.3.1-14 | A |
| 87 | Piping | Pressure boundary | Steel | Raw water (Internal) | Loss of material | Fire Water | VII.G-24 | 3.3.1-68 | A |
| 88 | Piping | Pressure boundary | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |

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| Table 3.3.2-22 Aging Management Review Results –Fire Protection System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Row No.** | **Component Type** | **Intended Function(s)** | **Material** | **Environment** | **Aging Effect Requiring Management** | **Aging Management Program** | **NUREG-1801 Volume 2 Item** | **Table 1 Item** | **Notes** |
| 169 | Valve Body | Pressure boundary | Gray Cast Iron | Raw water (Internal) | Loss of material | Selective Leaching Inspection | VII.G-14 | 3.3.1-85 | A |
| 170 | Valve Body | Pressure boundary | Gray Cast Iron | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A 0331 |
| 171 | Valve Body | Pressure boundary | Stainless Steel | Raw water (Internal) | Loss of material | Fire Water | VII.G-19 | 3.3.1-69 | A |
| 172 | Valve Body | Pressure boundary | Stainless Steel | Air-indoor uncontrolled (External) | None | None | VII.J-15 | 3.3.1-94 | A |
| 173 | Valve Body | Pressure boundary | Steel | Air-indoor uncontrolled (Internal) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | C 0302 |
| 174 | Valve Body (exhaust) | Pressure boundary | Steel | Air-outdoor (Internal) | Loss of material | Diesel-Driven Fire Pumps Inspection | VII.H2-2 | 3.3.1-18 | E 0322 |
| 175 | Valve Body | Pressure boundary | Steel | Fuel oil (Internal) | Loss of material | Fire Protection | VII.G-21 | 3.3.1-64 | B |
| 176 | Valve Body | Pressure boundary | Steel | Fuel oil (Internal) | Loss of material | Fuel Oil Chemistry | VII.G-21 | 3.3.1-64 | B |

**Table 3.3.2-22 Aging Management Review Results –Fire Protection System**

| Row No. | Component Type | Intended Function(s) | Material | Environment | Aging Effect Requiring Management | Aging Management Program | NUREG-1801 Volume 2 Item | Table 1 Item | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 177 | Valve Body | Pressure boundary | Steel | Raw water (Internal) | Loss of material | Fire Water | VII.G-24 | 3.3.1-68 | A |
| 178 | Valve Body | Pressure boundary | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |
| 179 | Valve Body | Pressure boundary | Steel | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |
| 180 | Valve Body | Pressure boundary | Steel | Soil (External) | Loss of material | Buried Piping and Tanks Inspection | VII.G-25 | 3.3.1-19 | A |

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Insert A from Pages 3.3-256a-f

| 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

Insert new rows 102 and 103 for Table 3.3.2-36 as shown on page 3.3-328c

| 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** |
| 102 | Piping | Pressure boundary | Steel | Air-outdoor (Internal) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | C 0324 |
| 103 | Piping | Pressure boundary | Steel | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A 0331 |

| Table 3.3.2-42 Aging Management Review Results – Standby Service Water System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Row No.** | **Component Type** | **Intended Function(s)** | **Material** | **Environment** | **Aging Effect Requiring Management** | **Aging Management Program** | **NUREG-1801 Volume 2 Item** | **Table 1 Item** | **Notes** |
| 42 | Orifice | Structural integrity | Stainless Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-15 | 3.3.1-79 | B |
| 43 | Orifice | Structural integrity | Stainless Steel | Air-outdoor (External) | None | None | N/A | N/A | G |
| 44 | Orifice | Throttling | Stainless Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-15 | 3.3.1-79 | B |
| 45 | Orifice | Throttling | Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 46 | Piping | Pressure boundary | Stainless Steel | Air-indoor uncontrolled (Internal) | None | None | VII.J-15 | 3.3.1-94 | A 0306 |
| 47 | Piping | Pressure boundary | Stainless Steel | Air-outdoor (Internal) | None | None | N/A | N/A | G |
| 48 | Piping | Pressure boundary | Stainless Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-15 | 3.3.1-79 | B |
| 49 | Piping | Pressure boundary | Stainless Steel | Air-indoor uncontrolled (External) | None | None | VII.J-15 | 3.3.1-94 | A |
| 50 | Piping | Pressure boundary | Stainless Steel | Air-outdoor (External) | None | None | N/A | N/A | G |

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| Table 3.3.2-42 Aging Management Review Results – Standby Service Water System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Row No.** | **Component Type** | **Intended Function(s)** | **Material** | **Environment** | **Aging Effect Requiring Management** | **Aging Management Program** | **NUREG-1801 Volume 2 Item** | **Table 1 Item** | **Notes** |
| 51 | Piping | Pressure boundary | Stainless Steel | Condensation (External) | Loss of material | External Surfaces Monitoring | VII.F2-1 | 3.3.1-27 | E |
| 52 | Piping | Pressure boundary | Steel | Air-indoor uncontrolled (Internal) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | C 0302 |
| 53 | Piping | Pressure boundary | Steel | Air-outdoor (Internal) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | C 0324 |
| 54 | Piping | Pressure boundary | Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 55 | Piping | Pressure boundary | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |
| 56 | Piping | Pressure boundary | Steel | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |
| 57 | Piping | Pressure boundary | Steel | Condensation (External) | Loss of material | External Surfaces Monitoring | VII.I-11 | 3.3.1-58 | A |
| 58 | Piping | Pressure boundary | Steel | Raw water (External) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 59 | Piping | Pressure boundary | Steel | Soil (External) | Loss of material | Buried Piping and Tanks Inspection | VII.C1-18 | 3.3.1-19 | A |

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**Table 3.3.2-42 Aging Management Review Results – Standby Service Water System**

| Row No. | Component Type | Intended Function(s) | Material | Environment | Aging Effect Requiring Management | Aging Management Program | NUREG-1801 Volume 2 Item | Table 1 Item | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 96 | Valve Body | Pressure boundary | Stainless Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-15 | 3.3.1-79 | B |
| 97 | Valve Body | Pressure boundary | Stainless Steel | Air-indoor uncontrolled (External) | None | None | VII.J-15 | 3.3.1-94 | A |
| 98 | Valve Body | Pressure boundary | Stainless Steel | Air-outdoor (External) | None | None | N/A | N/A | G |
| 99 | Valve Body | Pressure boundary | Stainless Steel | Condensation (External) | Loss of material | External Surfaces Monitoring | VII.F2-1 | 3.3.1-27 | E |
| 100 | Valve Body | Pressure boundary | Steel | Air-outdoor (Internal) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | C 0324 |
| 101 | Valve Body | Pressure boundary | Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 102 | Valve Body | Pressure boundary | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |
| 103 | Valve Body | Pressure boundary | Steel | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |
| 104 | Valve Body | Pressure boundary | Steel | Condensation (External) | Loss of material | External Surfaces Monitoring | VII.I-11 | 3.3.1-58 | A |

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| Table 3.3.2-42 Aging Management Review Results – Standby Service Water System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Row No. | Component Type | Intended Function(s) | Material | Environment | Aging Effect Requiring Management | Aging Management Program | NUREG-1801 Volume 2 Item | Table 1 Item | Notes |
| 105 | Valve Body | Structural integrity | Stainless Steel | Air-indoor uncontrolled (Internal) | None | None | VII.J-15 | 3.3.1-94 | A 0306 |
| 106 | Valve Body | Structural integrity | Stainless Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-15 | 3.3.1-79 | B |
| 107 | Valve Body | Structural integrity | Stainless Steel | Air-indoor uncontrolled (External) | None | None | VII.J-15 | 3.3.1-94 | A |
| 108 | Valve Body | Structural integrity | Steel | Air-indoor uncontrolled (Internal) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | C 0302 |
| 109 | Valve Body | Structural integrity | Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 110 | Valve Body | Structural integrity | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |

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Add new rows 111 through 116 shown on page 3.3-390a

Insert new row 117 shown on Page 3.3-390b



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| Table 3.3.2-43 Aging Management Review Results – Tower Makeup Water System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Row No.** | **Component Type** | **Intended Function(s)** | **Material** | **Environment** | **Aging Effect Requiring Management** | **Aging Management Program** | **NUREG-1801 Volume 2 Item** | **Table 1 Item** | **Notes** |
| 10 | Orifice | Pressure boundary | Stainless Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-15 | 3.3.1-79 | B |
| 11 | Orifice | Pressure boundary | Stainless Steel | Condensation (External) | Loss of material | External Surfaces Monitoring | VII.F2-1 | 3.3.1-27 | E |
| 12 | Orifice | Throttling | Stainless Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-15 | 3.3.1-79 | B |
| 13 | Piping | Pressure boundary | Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 14 | Piping | Pressure boundary | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |
| 15 | Piping | Pressure boundary | Steel | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |
| 16 | Piping | Pressure boundary | Steel | Condensation (External) | Loss of material | External Surfaces Monitoring | VII.I-11 | 3.3.1-58 | A |
| 17 | Piping | Pressure boundary | Steel | Raw water (External) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 18 | Piping | Pressure boundary | Steel | Soil (External) | Loss of material | Buried Piping and Tanks Inspection | VII.C1-18 | 3.3.1-19 | A |

0331

| Table 3.3.2-43 Aging Management Review Results – Tower Makeup Water System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Row No.** | **Component Type** | **Intended Function(s)** | **Material** | **Environment** | **Aging Effect Requiring Management** | **Aging Management Program** | **NUREG-1801 Volume 2 Item** | **Table 1 Item** | **Notes** |
| 28 | Strainer (screen) | Filtration | Steel | Raw water (External) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 29 | Strainer (body) | Pressure boundary | Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 30 | Strainer (body) | Pressure boundary | Steel | Condensation (External) | Loss of material | External Surfaces Monitoring | VII.I-11 | 3.3.1-58 | A |
| 31 | Tubing | Pressure boundary | Stainless Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-15 | 3.3.1-79 | B |
| 32 | Tubing | Pressure boundary | Stainless Steel | Air-indoor uncontrolled (External) | None | None | VII.J-15 | 3.3.1-94 | A |
| 33 | Tubing | Pressure boundary | Stainless Steel | Condensation (External) | Loss of material | External Surfaces Monitoring | VII.F2-1 | 3.3.1-27 | E |
| 34 | Valve Body | Pressure boundary | Gray Cast Iron | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 35 | Valve Body | Pressure boundary | Gray Cast Iron | Raw water (Internal) | Loss of material | Selective Leaching Inspection | VII.C1-11 | 3.3.1-85 | A |
| 36 | Valve Body | Pressure boundary | Gray Cast Iron | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |

0331

| Table 3.3.2-43 Aging Management Review Results – Tower Makeup Water System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Row No.** | **Component Type** | **Intended Function(s)** | **Material** | **Environment** | **Aging Effect Requiring Management** | **Aging Management Program** | **NUREG-1801 Volume 2 Item** | **Table 1 Item** | **Notes** |
| 37 | Valve Body | Pressure boundary | Steel | Raw water (Internal) | Loss of material | Open-Cycle Cooling Water | VII.C1-19 | 3.3.1-76 | B |
| 38 | Valve Body | Pressure boundary | Steel | Air-indoor uncontrolled (External) | Loss of material | External Surfaces Monitoring | VII.I-8 | 3.3.1-58 | A |
| 39 | Valve Body | Pressure boundary | Steel | Air-outdoor (External) | Loss of material | External Surfaces Monitoring | VII.I-9 | 3.3.1-58 | A |
| 40 | Valve Body | Pressure boundary | Steel | Condensation (External) | Loss of material | External Surfaces Monitoring | VII.I-11 | 3.3.1-58 | A |

0331

Insert new rows 41 through 44 for Table 3.3.2-43 as shown on page 3.3-395a

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. |
| 0330 | No applicable aging effects have been identified for concrete or polymer piping exposed to soil. However, the Buried Piping and Tanks Inspection Program is credited with confirming the absence of significant aging effects during the period of extended operation. |
| 0331 | For steel components located underground in outdoor vaults, valve pits and guard pipes, the Buried Piping and Tanks Inspection Program is also credited with managing loss of material. For stainless steel components located underground in outdoor vaults or valve pits, the Buried Piping and Tanks Inspection Program manages the effects of loss of material by ensuring that degradation is not occurring. |



~~Amendment 1~~ 25
~~Amendment 2~~ Amendment ~~21~~

### A.1.2.4 Bolting Integrity Program

Replace Section A.1.2.5 with Insert D from Page A-9b.

The Bolting Integrity Program is a combination of existing activities that, in conjunction with other credited programs, address the management of aging for the bolting of mechanical components and structural connections within the scope of license renewal. The Bolting Integrity Program relies on manufacturer and vendor information and industry recommendations for the proper selection, assembly, and maintenance of bolting for pressure-retaining closures and structural connections. The Bolting Integrity Program includes, through the Inservice Inspection (ISI) Program, Inservice Inspection (ISI) Program – IWF, Structures Monitoring Program, and External Surfaces Monitoring Program, the periodic inspection of bolting for indications of degradation such as leakage, loss of material due to corrosion, loss of pre-load, and cracking due to stress corrosion cracking (SCC) and fatigue.

Replace deleted text with Insert A on page A-9a

### A.1.2.5 Buried Piping and Tanks Inspection Program

~~The Buried Piping and Tanks Inspection Program manages the effects of loss of material due to corrosion on the external surfaces of piping and tanks exposed to a buried environment.~~ The Buried Piping and Tanks Inspection Program is a combination of a mitigation program (consisting of protective coatings) and a condition monitoring program (consisting of visual inspections).

Insert B from page A-9a

An inspection of buried piping will be performed within the 10-year period prior to entering the period of extended operation. An additional inspection of buried piping will be performed within 10 years after entering the period of extended operation.

The Buried Piping and Tanks Inspection Program is an existing program that requires enhancement prior to the period of extended operation.

Insert C from page A-9a

### A.1.2.6 BWR Feedwater Nozzle Program

The BWR Feedwater Nozzle Program is an existing program that manages cracking due to stress corrosion cracking and intergranular attack (SCC/IGA) and flaw growth of the feedwater nozzles. The BWR Feedwater Nozzle Program is in accordance with ASME Section XI and NRC augmented requirements.

The BWR Feedwater Nozzle Program consists of: (a) enhanced inservice inspection in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWB, Table IWB 2500-1 (2001 edition including the 2002 and 2003 Addenda) and the recommendations of General Electric report NE-523-A71-0594-A [Reference A.1.4-1], and (b) system modifications, as described in FSAR Section 5.3.3.1.4.5, to mitigate cracking. The program specifies periodic ultrasonic inspection of critical regions of the feedwater nozzles.

~~Insert A to LRA Section A.1.2.5~~

~~The Buried Piping and Tanks Inspection Program manages the effects of loss of material due to corrosion on the external surfaces of piping, piping components and tanks exposed to a buried environment. The program also manages the effects of cracking, loss of material and loss of pre-load for bolting exposed to a buried environment.~~

Replace Inserts A, B and C to LRA Section 1.2.5 with Insert D from Page A-9b.

~~Insert B~~

~~The Buried Piping and Tanks Inspection Program also manages the effects of loss of material due to corrosion on the external surfaces of the COND System piping that is below grade, enclosed in guard pipe, and exposed to an uncontrolled air environment.~~

~~Insert C~~

~~An inspection of the COND System piping that is below grade and enclosed in guard pipe will be performed within the 10 year period prior to entering the period of extended operation. Additional inspections of the COND System piping that is below grade and enclosed in guard pipe will be performed in each 10 year period after entering the period of extended operation.~~

Insert D to LRA Section A.1.2.5

### A.1.2.5 Buried Piping and Tanks Inspection Program

The Buried Piping and Tanks Inspection Program manages the effects of loss of material due to corrosion on the external surfaces of metallic piping and tanks that are buried or underground. The program also manages the effects of cracking, loss of material (and loss of pre-load) for bolting that is buried. In addition, the program also verifies that aging degradation is not occurring for concrete and polymer piping that is buried.

The Buried Piping and Tanks Inspection Program is a combination of a mitigation program (consisting of protective coatings, cathodic protection, and backfill quality) and a condition monitoring program (consisting of electrochemical verification of cathodic protection, confirmation of backfill quality, visual inspections of pipe or tank external surfaces, and non-destructive evaluation of pipe or tank wall thickness as needed).

Inspections of buried and underground piping and buried tanks will be performed within the 10-year period prior to entering the period of extended operation. Additional inspections of buried and underground piping and buried tanks will be performed within 10 years after entering the period of extended operation, and in each 10 year period thereafter.

The Buried Piping and Tanks Inspection Program is an existing program that requires enhancement prior to the period of extended operation

Replace Item Number 5, as previously amended, with Insert C to LRA Table A-1 Item Number 5 on Pages A-43b-e.



**Table A-1**
**Columbia License Renewal Commitments**

| Item Number | Commitment | FSAR Supplement Location (LRA App. A) | Enhancement or Implementation Schedule |
|---|---|---|---|
| 5) Buried Piping and Tanks Inspection Program | The Buried Piping and Tanks Inspection Program is an existing program that will be continued for the period of extended operation, with the following enhancements:<br>• Revise the site program document to include the buried portions of the Radwaste Building Outside Air (WOA) piping.<br>• Require that an inspection of a representative sample of buried piping be performed within the 10-year period prior to entering the period of extended operation (i.e., between year 30 and year 40).<br>• Require an additional inspection of a representative sample of buried piping be performed within 10 years after entering the period of extended operation (i.e., between year 40 and year 50). | A.1.2.5<br>Add Insert A from page A-43a | Enhancement prior to the period of extended operation.<br>Then ongoing. |
| 6) BWR Feedwater Nozzle Program | The BWR Feedwater Nozzle Program is an existing program that will be continued for the period of extended operation.<br>and below grade | A.1.2.6 | Ongoing<br>Add insert B from Page A-43a |
| 7) BWR Penetrations Program | The BWR Penetrations Program is an existing program that will be continued for the period of extended operation. | A.1.2.7 | Ongoing |
| 8) BWR Stress Corrosion Cracking Program | The BWR Stress Corrosion Cracking Program is an existing program that will be continued for the period of extended operation. | A.1.2.8 | Ongoing |

Replace Inserts A and B to LRA Table A-1 Item Number 5 with Insert C to LRA Table A-1 Item Number 5 on Pages A-43b-e.



Insert A to LRA Table A-1 Item Number 5

- Revise the site program document to include cracking, loss of material and loss of pre-load of bolting as aging effects managed by the program.
- Revise the site program document to include loss of material of stainless steel piping and piping components as an aging effect managed by the program.

Insert B to LRA Table A-1 Item, Number 5

- Revise the site program document to include loss of material of COND System piping that is below grade and enclosed in guard pipe.



25

~~15~~

Insert C to LRA Table A-1 Item Number 5

**Table A-1**
**Columbia License Renewal Commitments**

| Item Number | Commitment | FSAR Supplement Location (LRA App. A) | Enhancement or Implementation Schedule |
|---|---|---|---|
| 5) Buried Piping and Tanks Inspection Program | The Buried Piping and Tanks Inspection Program is an existing program that will be continued for the period of extended operation, with the following enhancements:<br>• Revise the site program document to include:<br>o cracking, loss of material and loss of pre-load of bolting as aging effects managed by the program.<br>o loss of material for (buried) stainless steel piping and piping components as an aging effect managed by the program.<br>o components that are located underground (below grade) in areas, such as outdoor vaults, valve pits and inside guard pipes where access for inspection is restricted.<br>o buried concrete and polymeric (PVC) piping to confirm the absence of significant aging effects.<br>• Revise the site program document to:<br>o Confirm (prior to the period of extended operation) that all portions of buried piping and components, except for the Diesel Fuel Oil System, in the scope of license renewal are provided with cathodic protection through the period of extended operation. | A.1.2.5 | Enhancement prior to the period of extended operation.<br>Then ongoing. |

**Table A-1**
***Columbia License Renewal Commitments***

<table>
<tr><th>Item Number</th><th>Commitment</th><th>FSAR Supplement Location (LRA App. A)</th><th>Enhancement or Implementation Schedule</th></tr>
<tr><td></td><td>
<ul>
<li>Ensure that cathodic protection is operable at least 90% of the time between inspections during the period of extended operation.</li>
<li>Ensure that deviations from cathodic protection criteria are less than 90 days duration during the period of extended operation.</li>
</ul>
• Revise the site program document to:
<ul>
<li>require that inspection of a representative sample of each buried and underground piping material and buried tank be performed within the 10-year period prior to entering the period of extended operation (i.e., between year 30 and end of year 40) and in each 10 year interval of the period of extended operation (i.e., between year 40 and year 50, and again between year 50 and year 60) per the following table:</li>
</ul>
<table>
<tr><th rowspan="2">Material / Location (buried or underground)</th><th colspan="2">Number or Percentage of Inspections (per 10-Year interval through end of the period of extended operation)</th></tr>
<tr><th>Code-Class/Safety-Related/Other</th><th>Hazmat</th></tr>
<tr><td>Polymer / Buried</td><td>1</td><td>--</td></tr>
<tr><td>Concrete / Buried</td><td>1</td><td>--</td></tr>
<tr><td>Stainless Steel / Buried</td><td>1</td><td>--</td></tr>
<tr><td>Steel / Buried</td><td>1</td><td>2%</td></tr>
<tr><td>Stainless Steel /</td><td>1</td><td>--</td></tr>
</table>
</td><td></td><td></td></tr>
</table>

**Table A-1**
**Columbia License Renewal Commitments**

| Item Number | Commitment | FSAR Supplement Location (LRA App. A) | Enhancement or Implementation Schedule |
|---|---|---|---|

| | | |
|---|---|---|
| Underground | | |
| Steel / Underground | 2 | 2% |
| Steel Tank / Buried | 1 | -- |

- require appropriate tactile (e.g., manual) examination of buried polymeric (PVC) components to supplement visual inspections for confirmation that significant aging effects are not occurring.
- require wall thickness measurement by a non-destructive examination technique such as ultrasonic testing (UT) and results documented for further evaluation, if loss of material has been detected.
- require confirmation that backfill is acceptable with regards to degradation of pipe coatings, and thereby, meets the objectives of NACE SP0169-2007.
- include collection of trending information on cathodic protection system effectiveness (e.g., potential difference and current measurements) and adjustment of the program as needed based on the results.
- include trending of the external surface condition or coating condition of buried and underground piping, piping components and buried tanks and adjustment of the program as needed based on the results.

• Revise the site program document for acceptance criteria associated with the inspections:

**Table A-1**
**Columbia License Renewal Commitments**

| Item Number | Commitment | FSAR Supplement Location (LRA App. A) | Enhancement or Implementation Schedule |
|---|---|---|---|
| | o Criteria for soil-to-pipe potential as listed in NACE Standard SP0169-2007<br>o Backfill is acceptable with regards to degradation of pipe external coatings and, thereby, meets the objectives of NACE Standard SP0169-2007<br>o For coated piping or tanks, either no evidence of coating degradation or the type and extent of coating degradation determined to be insignificant as evaluated by an individual with the qualifications to evaluate coati ngs.<br>o If coated or uncoated metallic piping show evidence of corrosion, the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained.<br>o Cracking or blistering of polymeric (PVC) piping is evaluated.<br>o Concrete piping may exhibit minor cracking and spalling provided there is no evidence of leakage or exposed rebar or reinforcing "hoop" bands. | | |

## Table B-2
## Consistency of Columbia Aging Management Programs with NUREG-1801

| Program Name | New / Existing | Consistent with NUREG-1801 | Consistent with NUREG-1801 with Exceptions | Plant-Specific | Enhancement Required |
|---|---|---|---|---|---|
| Aboveground Steel Tanks Inspection Section B.2.1 | New | -- | Yes | -- | -- |
| Air Quality Sampling Program Section B.2.2 | Existing | -- | -- | Yes | -- |
| Appendix J Program Section B.2.3 | Existing | Yes | -- | -- | -- |
| Bolting Integrity Program Section B.2.4 | Existing | -- | Yes | -- | -- |
| Buried Piping and Tanks Inspection Program Section B.2.5 | Existing | ~~Yes~~ -- | -- Yes | -- | Yes |
| BWR Feedwater Nozzle Program Section B.2.6 | Existing | Yes | -- | -- | -- |
| BWR Penetrations Program Section B.2.7 | Existing | Yes | -- | -- | -- |
| BWR Stress Corrosion Cracking Program Section B.2.8 | Existing | Yes | -- | -- | -- |
| BWR Vessel ID Attachment Welds Program Section B.2.9 | Existing | Yes | -- | -- | -- |

## B.2.5 Buried Piping and Tanks Inspection Program

Replace Program Description, including Inserts A and C on page B-39a, with Insert E to LRA B.2.5 on Page B-39b.

**Program Description**

~~The Buried Piping and Tanks Inspection Program will manage the effects of loss of material due to corrosion on the external surfaces of piping and tanks exposed to a buried environment.~~

~~Replace with Insert A on page B-39a~~

~~Insert C from page B-39a~~

~~The Buried Piping and Tanks Inspection Program is a combination of a mitigation program (consisting of protective coatings) and a condition monitoring program (consisting of visual inspections). Integrity of coatings will be inspected when components are excavated for maintenance or other reasons. If an opportunistic inspection has not occurred between year 30 and year 38, an excavation of a section of buried piping for the purpose of inspection will be performed before year 40. An additional inspection of buried piping will be performed within 10 years after entering the period of extended operation.~~

~~The Buried Piping and Tanks Inspection Program will continue to ensure that the pressure boundary integrity of the subject components is maintained consistent with the current licensing basis during the period of extended operation.~~

**NUREG-1801 Consistency**

The Buried Piping and Tanks Inspection Program is an existing Columbia program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M~~34~~, "Buried Piping and Tanks Inspection~~."~~ ,

as clarified below with an exception that applies only to buried piping and tanks in the Diesel Fuel Oil System.

41

and Underground

**Exceptions to NUREG-1801**

~~None.~~

Insert F to LRA Section B.2.5 on Pages B-39b-c.

**Required Enhancements**

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

- **Scope of Program –**

~~Revise the site program document to include the buried portions of the Radwaste Building Outside Air (WOA) piping.~~

Insert G to LRA Section B.2.5 on Pages B-39c-k.

Insert H to LRA Section B.2.5 on Pages B-39k-m.

Add Insert B on page B-39a

~~Insert D from page B-39a~~

~~Insert A to LRA Section B.2.5, page B-39~~

~~The Buried Piping and Tanks Inspection Program will manage the effects of loss of material due to corrosion on the external surfaces of piping, piping components and tanks exposed to a buried environment. The program also manages cracking, loss of material and loss of pre-load for bolting exposed to a buried environment.~~

Insert B to LRA Section B.2.5, page B-39

Revise the site program document to include cracking, loss of material and loss of pre-load of bolting as aging effects managed by the program.

Revise the site program document to include loss of material of stainless steel piping and piping components as an aging effect managed by the program.

~~Insert C to LRA Section B.2.5, page B-39~~ ← Replace with Insert E to LRA Section B.2.5 on pages B-39b.

~~The Buried Piping and Tanks Inspection Program will also manage the effects of loss of material due to corrosion on the external surfaces of the COND System piping that is below grade, enclosed in guard pipe, and exposed to an uncontrolled air environment.~~

~~Insert D to LRA Section B.2.5, page B-39~~ ← Replace with Insert F to LRA Section B.2.5 on pages B-39b-d.

~~Revise the site program document to include loss of material of COND System piping that is below grade and enclosed in guard pipe.~~

Insert E to LRA Section B.2.5 on page B-39

The Buried Piping and Tanks Inspection Program will manage the effects of loss of material due to corrosion on the external surfaces of metallic piping and tanks that are buried or underground. The program also manages cracking, loss of material and loss of pre-load for buried bolting. Additionally, the program will verify that aging degradation is not occurring for buried concrete and polymer piping.

Buried piping and tanks are those whose external surface is in direct contact with soil, or concrete of a wall penetration below grade. Underground piping and piping components are also located below grade, but are exposed to air and are contained within outdoor vaults, valve pits, or guard pipes where access for inspection is restricted. The Buried Piping and Tanks Inspection Program supplements the External Surfaces Monitoring Program in such instances.

The Buried Piping and Tanks Inspection Program is a combination of a mitigation program (consisting of protective coatings, cathodic protection, and backfill quality) and a condition monitoring program (consisting of electrochemical verification of cathodic protection, confirmation of backfill quality, visual inspections of pipe or tank external surfaces, and non-destructive evaluation of pipe or tank wall thicknesses as needed).

Integrity of coatings will be inspected when components are excavated for maintenance or other reasons. If opportunistic inspections have not occurred between year 30 and year 38, directed excavation of the requisite sections of buried piping and tanks for the purpose of inspection will be performed before the end of year 40. Additional inspections of buried and underground piping and buried tanks will be performed within 10 years of entering the period of extended operation, and in each 10 year period thereafter.

Insert F to LRA Section B.2.5, page B-39

Program Elements Affected:

- **Preventive Actions**

Cathodic protection (in accordance with NACE SP0169-2007 or NACE RP0285-2002) is not, and will not be, provided for Diesel Fuel Oil System piping and tanks in the scope of license renewal. As described in FSAR Section 9.5.4.3, regarding Diesel Generator fuel oil piping and tanks, "The overflow lines from the day tank to the storage tank run underground south of the diesel generator building. Diesel fuel oil pipe lines extending under the diesel generator building do not receive full protection from the exterior rectifier-anode system because of the electrical shielding effect of the ground grid and foundation reinforcing and structural steel. Since the earth area under the diesel generator building is sheltered and hence relatively much drier than the earth exterior to this building, no additional cathodic protection system is provided or required." FSAR Section 9.5.4.3 further indicates that the "exterior surfaces of the buried piping and components in the diesel oil supply system are coated with coal tar enamel. Application of coatings is in strict accordance with AWWA Specification C203."

Additionally, at least 2% of the total linear feet of in-scope buried hazmat piping (containing hazardous materials) will be inspected as part of the Buried Piping and Tanks Inspection Program prior to the period of extended operation and in each 10-year interval of the period of extended operation.

There are three diesel fuel oil storage tanks that are buried and in the scope of license renewal. The material for all of the fuel oil storage tanks is steel. The tanks are buried in Class 1 backfill beneath the Diesel Generator Building and are subject to periodic ultrasonic examinations.

As such, the corrosion protection provisions for the diesel oil piping and components and considerations described in the current licensing basis, with the inspections of hazmat piping planned as part of the Buried Piping and Tanks Inspection Program, and periodic ultrasonic examinations of diesel oil storage tanks provide reasonable assurance that the diesel oil piping and components will continue to perform their intended function consistent with the CLB through the period of extended operation.

Insert G to LRA Section B.2.5 on page B-39

Aging Management Program Elements

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

- Scope of Program

The scope of the Buried Piping and Tanks Inspection Program includes buried components that are within the scope of license renewal for Columbia. The scope will also include components within the scope of license renewal for Columbia that are located underground (below grade) in areas, such as outdoor vaults, valve pits and inside guard pipes, where access is restricted (See Required Enhancements).

The program is credited for managing loss of material due to crevice, general, and pitting corrosion and microbiologically influenced corrosion (MIC) for buried steel and gray cast iron piping components. The program will also be credited for managing cracking, loss of material (and loss of pre-load) of buried bolting, and for managing loss of material due to crevice and pitting corrosion and MIC of buried stainless steel piping and piping components (See Required Enhancements). The buried piping and piping components within the scope of this program are in the following plant systems:

- Circulating Water System (CW)
- Condensate Nuclear System (COND)
- Diesel Fuel Oil System (DO)
- Fire Protection System (FP)
- Standby Service Water System (SW)
- Tower Makeup Water System (TMU)

- Radwaste Building Outside Air System (WOA)

The Buried Piping and Tanks Inspection Program is also credited for managing loss of material due to general corrosion for buried steel tanks in the following system:

- Diesel Fuel Oil System (DO)
  - Diesel Fuel Oil Tanks (DO-TK-1A, -1B, -2)

In addition, the Buried Piping and Tanks Inspection Program will be credited for managing loss of material due to corrosion of metallic components that are located underground (below grade), in outdoor vaults, valve pits, or inside guard pipes where access is restricted, and are exposed to air in the following systems (See Required Enhancements):

- Circulating Water System (CW)
- Condensate Nuclear System (COND)
- Diesel Fuel Oil System (DO)
- Fire Protection System (FP)
- Standby Service Water System (SW)
- Tower Makeup Water System (TMU)
- Radwaste Building Outside Air System (WOA)

The Buried Piping and Tanks Inspection Program will also be credited with managing loss of material, cracking and loss of pre-load for the bolting associated with the buried and underground bolted closures that are within the scope of license renewal for Columbia (See Required Enhancements). The same inspections for buried and underground piping would also identify corroded, broken or loose bolting, with any further considerations addressed by the Bolting Integrity Program.

Furthermore, the Buried Piping and Tanks Inspection Program will also be used to confirm the absence of significant aging effects that could result in a loss of component intended function during the period of extended operation for buried concrete and polymeric piping in the following systems (See Required Enhancements):

- Circulating Water (CW) – Concrete
- Fire Protection (FP) – Polymer (PVC)

- Preventive Actions

Consistent with standard industry practices, such as described in National Association of Corrosion Engineers (NACE) Standard Practice SP0169-2007, and in accordance with plant design specifications, buried metallic piping and tanks are provided with protective coatings during installation for protection from direct contact with soil. Piping, and piping components that are located underground, and exposed to air in outdoor

vaults, valve pits, and guard pipes, are also provided with protective coatings during installation, as warranted.

Cathodic Protection in accordance with NACE SP0169-2207 and SP0572-2007 is also provided for buried metallic piping and components in locations determined by a site soil corrosivity assessment. The equipment used to implement cathodic protection for Columbia is not qualified in accordance with 10 CFR 50 Appendix B, but the system is operated so that NACE SP0169-2007 criteria and considerations are met at the pertinent locations in the systems, with rectifier voltage and current samples checked every three months, unless justified otherwise, and pipe to soil voltage measurements taken once a year.

Prior to the period of extended operation, confirmation is required that cathodic protection is provided for all buried piping and components, except for the Diesel Fuel Oil System, in the scope of license renewal through the period of extended operation. This includes buried piping in the Radwaste Building HVAC System (WOA) that is currently not protected or only partially protected. Enhancement is also required prior to the period of extended operation to ensure that cathodic protection is operable for at least 90% of the time between inspections through the period of extended operation and that the duration of deviations from cathodic protection criteria through the period of extended operation is less than 90 days (See *Required Enhancements* above).

As described in FSAR Section 9.5.4.3, regarding Diesel Generator fuel oil piping and tanks, "The overflow lines from the day tank to the storage tank run underground south of the diesel generator building. Diesel oil pipe lines extending under the diesel generator building do not receive full protection from the exterior rectifier-anode system because of the electrical shielding effect of the ground grid and foundation reinforcing and structural steel. Since the earth area under the diesel generator building is sheltered and hence relatively much drier than the earth exterior to this building, no additional cathodic protection system is provided or required." Therefore, the buried diesel generator fuel oil storage tanks (DO-TK-1A, -1B, -2) and piping are not provided with cathodic protection that is explicitly in accordance with NACE RP0285-2002. See the *Detection of Aging Effects* element below.

In addition, soil excavation, backfill and compaction are controlled in accordance with standard industry practices. Backfill material that has been placed in accordance with plant procedure and specification is expected to be acceptable with regards to degradation of buried coatings, and to meet the objectives of NACE SP0169-2007. Overall, the quality of the backfill is regulated by the gradation of the soil material used as backfill. Additionally, the procedure requires that all backfill material be free of trash, roots, organic, frozen or other unsuitable material and bedding material (sand) be provided around pipes. Backfill material at Columbia is granular soil that is a size less restrictive than, ASTM D 448-08 size number 67. Also, bedding material at Columbia is less restrictive than ASTM D 448-08 size number 10. Confirmation of the quality of the backfill will be included in the inspections described for the *Parameters Monitored or Inspected* and *Detection of Aging Effects* elements below (See Required

Enhancements). Flowable backfill material (controlled low strength material) is not used at Columbia.

Fire mains are installed in accordance with National Fire Protection Association (NFPA) Standard 24. The system undergoes a periodic flow test in accordance with NFPA 25 as part of the Fire Water Program.

- Parameters Monitored or Inspected

The integrity of coatings for buried piping, piping components and tanks will be visually inspected when piping is excavated for maintenance or other reasons, or when excavated for the purpose of inspection. Evidence of damaged coatings or of coating defects will be documented for further evaluation. In such instances, loss of material or cracking of bolts will also be monitored by visual inspection of the piping, piping component, or tank. Wall thickness will be determined by a non-destructive examination technique such as ultrasonic testing (UT) when evidence of loss of material has been detected and documented for further evaluation (See Required Enhancements).

Additionally, the pipe-to-soil voltage and cathodic protection current for buried metallic piping and piping components are monitored periodically, as described for the *Preventive Actions* element above.

The integrity of coatings or exterior surfaces of underground piping and piping components within the scope of license renewal for Columbia will be visually inspected when outdoor vaults, valve pits, and guard pipes are opened as described for the *Detection of Aging Effects* element (See Required Enhancements).

The quality of backfill material with regards to degradation of piping external coatings will also be confirmed through visual inspection of the coatings when buried piping is excavated for maintenance or other reasons, or when excavated for the purpose of inspection (See Required Enhancements).

Furthermore, the integrity of coatings and visual appearance of the exterior of buried concrete and polymeric piping that is within the scope of license renewal for Columbia will be monitored when piping is excavated for maintenance or other reasons, or when excavated for the purpose of inspection, as described for the *Detection of Aging Effects* element below, to confirm the absence of significant aging effects during the period of extended operation. As warranted, visual inspection of buried polymeric piping that is within the scope of license renewal for Columbia will be supplemented by the appropriate tactile (e.g., manual) examination of the PVC. (See Required Enhancements)

- Detection of Aging Effects

Integrity of coatings will be visually inspected when buried piping, piping components and tanks in the scope of license renewal for Columbia are excavated for maintenance or other reasons, or when excavated for direct inspection (if opportunistic inspections have not occurred). Integrity of coatings or exterior surface conditions of underground piping and piping components within the scope of license renewal for Columbia will be

visually inspected when outdoor vaults, valve pits, or guard pipes are opened for maintenance or other reasons, or when opened for direct inspection (if opportunistic inspections have not occurred).

There are no tanks within the scope of license renewal for Columbia that are located underground and are not exposed to soil. Inspections of buried and underground piping, piping components and buried tanks within the scope of license renewal for Columbia will be performed in accordance to the following table:

**Inspections of Buried Pipe, Underground Pipe, and Buried Tanks in the Scope of License Renewal for Columbia**

| Material / Location (buried or underground) | Preventive Actions[1] | Number or Percentage of Inspections (per 10-Year interval through end of the period of extended operation)[2] | |
|---|---|---|---|
| | | Code-Class/Safety-Related/Other [3] | Hazmat[4] |
| Polymer / Buried[5] | A | 1 | -- |
| Concrete / Buried | -- | 1 | -- |
| Stainless Steel / Buried | -- | 1 | -- |
| Steel / Buried | D | 1 | 2%[4] |
| Stainless Steel / Underground | -- | 1 | -- |
| Steel / Underground | -- | 2 | 2%[4] |
| Steel Tank / Buried | E | 1 | -- |

(1) Preventive actions are categorized as follows (from NUREG-1801, Rev .2, Section XI.M41, as clarified for applicability to Columbia, unless specific to Columbia):

A. Backfill is in accordance with NACE SP0169-2007, Section 5.2.3, and meets American Society of Tests and Materials (ASTM) D 448-08 size number 67 within 6 inches of buried piping.

Backfill activities and materials at Columbia meet these considerations, and are confirmed during the inspection as described for the Parameters Monitored or Inspected element above.

B. Backfill is not in accordance with NACE SP0169-2007, Section 5.2.3, or does not meet ASTM D 448-08 size number 67 within 6 inches of buried pipe. (Not referenced)

C. External corrosion control is provided in accordance with NACE SP0169-2007. Each cathodic protection system (a) was installed at least 5 years prior to the period of extended operation and was operational for 90% of the time during that 5-year period or (b) was operational for 90% of the time since the last inspection conducted under this program. (Not referenced)

D. Cathodic Protection at Columbia uses the guidance of NACE SP0169-2007 and the system was upgraded more than five years prior to the period of extended operation. However, plant operating experience does not support system operation more than or equal to 90% of the time.

Energy-Northwest plans to upgrade its cathodic protection system prior to the period of extend operation to ensure 1) coverage to all buried piping and components in the scope of license renewal, except the Diesel Fuel Oil System, 2) operability at least 90% of the time between inspections during the period of extended operation, and 3) that durations of deviations from cathodic protection criteria do not exceed 90 days during the period of extended operation.

E. Coatings and backfill are in accordance with Table 2a of this AMP, but cathodic protection is not provided or is not consistent with criteria C or D. This category is provided for use during the 10 years prior to the period of extended

**Inspections of Buried Pipe, Underground Pipe, and Buried Tanks in the Scope of License Renewal for Columbia**

operation by applicants who are not able to install cathodic protection in accordance with program element 2 prior to entry into the period of extended operation. Following entry into the period of extended operation, consistency with program element 2 or an approved alternative is expected.

For the buried Diesel Fuel Oil System piping and tanks, coatings and backfill are in accordance with Table 2a of this AMP (NUREG-1801, Rev. 2, Section XI.M1, Element 2 (Preventive Action), but cathodic protection is not provided or required since it is not effective in the location as described in FSAR Section 9.5.4.3. This is an exception to NUREG-1801, Rev. 2, Section XI.M41.

F. As described for the *Preventive Actions* element and Note D above, cathodic protection is conservatively considered not to be provided for the diesel generator fuel oil storage tanks or for buried piping and piping components. Preventive actions provided do not meet criteria C, D, or E (Not referenced).

(2) Inspections are listed as either a discrete number of visual examinations (excavations) or as a percentage of the linear length of piping under consideration. The following guidance related to the extent of inspections is provided:

a. Each inspection will examine either the entire length of a run of pipe or a minimum of 10 feet.

b. If the number of inspections times the minimum inspection length (10 feet) exceeds 10% of the length of the piping under consideration, only 10% need be inspected.

c. If the total length of in-scope pipe constructed of a given material times the percentage to be inspected is less than 10 feet, either 10 feet or the total length of pipe present, whichever is less, will be inspected.

d. Code Class and safety-related pipe that also meets the definition of hazmat pipe will be inspected as hazmat pipe.

(3) The buried and underground piping and piping components within the scope of license renewal for Columbia include code-class, safety-related piping and other piping and non-safety-related piping and components that are required for compliance with regulated event or are credited with a non-safety-related function.

(4) Hazmat pipe is pipe that, during normal operation, contains material that, if released, could be detrimental to the environment. This includes chemical substances such as diesel fuel and radioisotopes. To be considered hazmat, the concentration of radioisotopes within the pipe during normal operation must exceed established standards such as the EPA drinking water standard. In the absence of such standards, the concentration of the radioisotope must exceed the greater of background or reliable level of detection. For tritium, the EPA drinking water standard (20,000 pCi/L) is used. (This approach for defining hazmat is consistent with that used in classifying fluid services in ASME B31.3 appendix M.)

Buried and underground piping and piping components within the scope of license renewal for Columbia that are considered hazmat (e.g., that contain diesel fuel or radioisotopes during normal plant operation) include diesel fuel oil lines and Condensate Nuclear (COND) lines to and from the Condensate Storage Tank (CST), respectively.

(5) Buried polymer is PVC, for which change in material properties cannot be determined by the same manipulation or prodding that would be used for elastomeric components, but would be expected to evidence as discoloration.

The first, baseline, inspections will be performed within the ten-year period prior to entering the period of extended operation (i.e., between year 30 and year 40). If opportunistic inspections have not occurred between year 30 and year 38, an excavation of section of buried piping for the purpose of inspection of each material will be performed before the end of year 40. Additional inspections of buried and underground piping, piping components and buried tanks within the scope of license renewal for Columbia will be performed during each 10-year period thereafter.

The inspection locations will be established based on evaluation of recent operating experience, the condition of buried and underground piping as known based on results of internal inspections or other relevant information, and a risk-based evaluation. Characteristics such as coating type, coating condition, cathodic protection efficacy, backfill characteristics, soil resistivity, pipe contents, and pipe function will be considered. Guided wave ultrasonic or other advanced inspection techniques may be used to determine those piping locations that should be inspected but will not be substituted for the inspections described above for this element.

Opportunistic inspections for buried and underground piping are preferable, as the excavation of piping and entry into areas where access is limited creates the risk of damaging an otherwise intact and functioning protective coating or of damaging the piping itself.

Visual inspections will be supplemented with surface and/or volumetric non-destructive testing (NDT), e.g., Ultrasonic Testing, if significant indications are observed. Visual inspections for polymeric materials will be augmented with manual examinations to detect hardening, softening, or other changes in material properties.

For buried tanks within the scope of license renewal for Columbia, examinations may be conducted from the external surface using visual techniques or from the internal surface of the tank using volumetric techniques. If inspected from the external surface, a minimum 25% area will be inspected. This will include at least some of both the top and bottom of the tank. If inspected internally by UT, at least one measurement per square foot of tank surface will be performed. UT measurements will be distributed uniformly over the surface of the tank. If inspected internally by another volumetric technique, at least 90% of the surface of the tank will be inspected.

For the purpose of this program, fire mains are periodically subjected to a flow test, as described in the *Preventive Actions* element above, with a flow test conducted by at least by the end of the next refueling outage or as directed by current licensing basis. Therefore, the fire mains are not subjected to the inspections described above, unless inspection of similar buried materials (e.g., steel or gray cast iron) in other systems identify degradation.

Adverse indications observed during inspections are entered into the plant corrective action program and will result in an expansion of sample size as determined by engineering evaluation conducted to determine the potential extent of the degradation observed. Inspection sample sizes within the affected piping categories will be increased as warranted, up to being doubled, to ensure that component intended function will be maintained through the period of extended operation. The doubling of the inspection sample size continues as necessary.

- *Monitoring and Trending*

The Buried Piping and Tanks Inspection Program requires that evidence of damaged coatings or coating defects identified during inspection activities be documented per the corrective action program (see discussion under Acceptance Criteria). Degradation of external coatings or piping surfaces of buried and underground piping and piping components, and of buried tanks, will be evaluated to determine other potentially susceptible locations. The susceptible locations will be monitored or inspected, as necessary, based on engineering evaluation.

The Buried Piping and Tanks Inspection Program will be enhanced to trend the effectiveness of coating conditions and the quality of backfill as confirmed during inspection activities (See Required Enhancements). For buried piping and piping components protected by cathodic protection systems, potential difference and current measurements are also trended.

Additionally, the Buried Piping and Tanks Inspection Program will be enhanced to trend the results of the inspection of polymeric (PVC) piping and surface and coating condition of underground metallic piping and piping components, when inspected as described in the *Detection of Aging Effects* element above (See Required Enhancements).

The fire mains are not managed through monitoring jockey pump activity but rather through flow test as described in Section 7.3 of NFPA 25, as part of the Fire Water Program.

- Acceptance Criteria

The Buried Piping and Tanks Inspection Program includes acceptance criteria to be used during inspections of coatings for buried piping, piping components and tanks. Degradation of coatings identified during inspection of buried piping, piping components and tanks will be documented and evaluated in accordance with the Columbia Corrective Action Program. An evaluation will be required to determine if, and to what extent, corrective actions are necessary.

The Buried Piping and Tanks Inspection Program will be enhanced to include the following acceptance criteria:

a. Criteria for soil-to-pipe potential as listed in NACE SP0169-2007 (e.g., - 0.85 VDC shift).

b. Backfill is acceptable with regards to coating degradation, and thereby, meets the objectives of NACE SP0169-2007.

c. For coated piping, piping components or tanks, either no evidence of coating degradation or the type and extent of coating degradation determined to be insignificant as evaluated by an individual with the qualifications to evaluate coatings.

d. If coated or uncoated metallic piping or tanks show evidence of corrosion, the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained. This may include different values for large area minimum wall thickness, and local area wall thickness.

e. Cracking or blistering of polymeric piping is evaluated, including appropriate (e.g., manual) examinations as warranted.

f. Concrete piping may exhibit minor cracking and spalling provided there is no evidence of leakage or exposed rebar or reinforcing "hoop" bands.

Flow tests for fire mains are conducted and evaluated as part of the Fire Water Program, in accordance with NFPA 25 Section 7.3, as described above. Furthermore, the fire mains are not managed by monitoring jockey pump activity, but by these flow tests. In addition, Columbia does not credit hydrostatic tests of buried and underground piping and piping components, and buried tanks in lieu of inspection.

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

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

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

Insert H to LRA Section B.2.5, page B-39

Revise the site program document to include components that are located underground (below grade) in areas, such as outdoor vaults, valve pits and inside guard pipes where access for inspection is restricted.

Revise the site program document to include buried concrete and polymeric (PVC) piping to confirm the absence of significant aging effects.

- **Preventive Actions**

  Revise the site program document to:

  - Confirm (prior to the period of extended operation) that all portions of buried piping and components, except for the Diesel Fuel Oil System, in the scope of license renewal are provided with cathodic protection through the period of extended operation.
  - Ensure that cathodic protection is operable at least 90% of the time between inspections during the period of extended operation.
  - Ensure that deviations from cathodic protection criteria are less than 90 days duration during the period of extended operation.

- **Parameters Monitored and Inspected, Detection of Aging Effects**

  Revise the site program document to:

  - Require that inspection of a representative sample of each buried and underground piping material and buried tank be performed within the 10-year period prior to entering the period of extended operation (i.e., between year 30 and end of year 40) and in each 10 year interval of the period of extended operation (i.e., between year 40 and year 50, and again between year 50 and year 60) per the following table:

| Material / Location (buried or underground) | Number or Percentage of Inspections (per 10-Year interval through end of the period of extended operation) | |
|---|---|---|
| | Code-Class/Safety-Related/Other | Hazmat |
| Polymer / Buried | 1 | -- |
| Concrete / Buried | 1 | -- |
| Stainless Steel / Buried | 1 | -- |
| Steel / Buried | 1 | 2% |
| Stainless Steel / Underground | 1 | -- |
| Steel / Underground | 2 | 2% |
| Steel Tank / Buried | 1 | -- |

- Require appropriate tactile (e.g., manual) examination of buried polymeric (PVC) components to supplement visual inspections for confirmation that significant aging effects are not occurring.
- Require wall thickness measurement by a non-destructive examination technique such as ultrasonic testing (UT) and results documented for further evaluation, if loss of material has been detected.
- Require confirmation that backfill is acceptable with regards to degradation of pipe coatings, and thereby, meets the objectives of NACE SP0169-2007.

- **Monitoring and Trending**

  Revise the site program document to:

  - include collection of trending information on cathodic protection system effectiveness (e.g., potential difference and current measurements) and adjustment of the program as needed based on the results.
  - include trending of the external surface condition or coating condition of buried and underground piping, piping components and buried tanks and adjustment of the program as needed based on the results.

- ***Acceptance Criteria***

  Revise the site program document for acceptance criteria associated with the inspections:

  - Criteria for soil-to-pipe potential as listed in NACE Standard SP0169-2007

- Backfill is acceptable with regards to degradation of pipe external coatings and, thereby, meets the objectives of NACE Standard SP0169-2007
- For coated piping or tanks, either no evidence of coating degradation or the type and extent of coating degradation determined to be insignificant as evaluated by an individual with the qualifications to evaluate coatings.
- If coated or uncoated metallic piping show evidence of corrosion, the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained.
- Cracking or blistering of polymeric (PVC) piping is evaluated.
- Concrete piping may exhibit minor cracking and spalling provided there is no evidence of leakage or exposed rebar or reinforcing "hoop" bands.

- ~~**Detection of Aging Effects –**~~

  ~~Require that an inspection of a representative sample of buried piping be performed within the 10-year period prior to entering the period of extended operation (i.e., between year 30 and year 40).~~

  ~~Require an additional inspection of a representative sample of buried piping be performed within 10 years after entering the period of extended operation (i.e., between year 40 and year 50).~~

~~Insert B from page B-40a~~

**Operating Experience**

plant-specific

, stainless steel, and polymeric (PVC)

No history of piping degradation due to external corrosion of buried piping was identified for Columbia through searches of operating experience or discussions with program owners. Columbia operating experience demonstrates that the coating of buried steel piping and tanks is effective in managing the effects of aging. Plant design considerations addressed the potential for degradation of buried piping components through the application of protective coatings.

Insert I to LRA Section B.2.5 on Page B-40b.

A review was conducted of station piping failures, and it was determined that there had been no documented failures attributed to externally-initiated corrosion. Identified instances of leakage associated with buried piping have been the result of internal corrosion.

Insert J to LRA Section B.2.5 on Page B-40b.

Insert K to LRA Section B.2.5 on Page B-40b.

The environmental conditions at Columbia are very good based on the sandy soil and electrolyte resistivity of the soil which is considered very high. This has resulted in minimal degradation of buried piping as evidenced by excavations of certain sections of piping for examination. There have been no significant areas of degradation caused by protective coating failure. This was determined after a section of buried Standby Service Water (SW) System piping was excavated and evaluated in 2007.

**Conclusion**

Insert L to LRA Section B.2.5 on Page B-40b.

~~Replace with Insert A on Page B-40a~~

~~The Buried Piping and Tanks Inspection Program will manage loss of material due to corrosion for susceptible piping components and tanks in buried environments.~~ The Buried Piping and Tanks Inspection Program, with the required enhancements, provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Insert M to LRA Section B.2.5 on Page B-40c.

~~Insert C from page B-40a~~

~~Insert A to LRA Section B.2.5, page B-40~~

~~The Buried Piping and Tanks Inspection Program will manage cracking and loss of pre-load of bolting and loss of material due to corrosion for susceptible bolting, piping, piping components and tanks in buried environments.~~

~~Insert B to LRA Section B.2.5, page B-40~~

~~Require that an inspection of the COND System piping that is below grade and enclosed in guard pipe be performed within the 10 year period prior to entering the period of extended operation (i.e., between year 30 and year 40).~~
~~Require additional inspections of the COND System piping that is below grade and enclosed in guard pipe be performed in each 10 year period after entering the period of extended operation (i.e., one between year 40 and year 50, and one between year 50 and year 60).~~

~~Insert C to LRA Section B.2.5, page B-40~~

~~The Buried Piping and Tanks Inspection Program will also manage the effects of loss of material due to corrosion on the external surfaces of the COND System piping that is below grade, enclosed in guard pipe, and exposed to an uncontrolled air environment.~~

Insert I to LRA Section B.2.5 on page B-40

, control of backfill, and in recent years, the consistent application of cathodic protection.

Insert J to LRA Section B.2.5 on page B-40

However, recent nuclear industry operating experience shows that buried piping and tanks are subject to corrosion such that periodic inspections of both buried and underground piping and piping components are warranted.

Insert K to LRA Section B.2.5 on page B-40

(low variability of cathodic protection factors and generally mild corrosivity conditions)

Insert L to LRA Section B.2.5 on page B-40

The Buried Piping and Tanks Inspection Program will manage loss of material due to corrosion and cracking of bolting for susceptible buried and underground piping, piping components and buried tanks.

Insert M to LRA Section B.2.5 on page B-40

, and in the case of buried concrete and polymeric piping that aging is not occurring,

## 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).

Insert A from Page B-101a.

### 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:

Insert A to LRA Section B.2.5 on page B-101

The External Surfaces Monitoring Program is also supplemented by the Buried Piping and Tanks Inspection Program to manage loss of material for the external surfaces of components located underground in outdoor vaults, valve pits, or guard pipes where access for inspection is restricted.