Nuclear Operating Company
South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

September 28, 2016
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File No. G25

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Additional Information for the
Review of the South Texas Project, Units 1 and 2,
Supplemental Information – (TAC Nos. ME4936 and ME4937)

References:

1. Letter; G. T. Powell to the NRC Document Control Desk; "License Renewal Application", NOC-AE-10002607; dated October 25, 2010. (ML103010257)
2. Letter; James Connolly to the NRC Document Control Desk; "Additional Information for the Review of the South Texas Project, Units 1 and 2, License Renewal Application – Aluminum Bronze AMP (TAC Nos. ME4936 and ME4937)"; dated July 28, 2016. (NOC-AE-16003394) (ML16221A391)
3. Summary of Telephone Conference Call; South Texas Project License Renewal Application; dated August 18, 2016. (ML16236A032)
4. Summary of Telephone Conference Call; South Texas Project License Renewal Application; dated August 11, 2016. (ML16236A304)
5. NRC Inspection Report; South Texas Project Electric Generating Station, Units 1 and 2 NRC License Renewal Inspection Report 05000498/2011007 AND 05000499/2011007, dated October 7, 2011. (AE-NOC-11002195) (ML112800109)

By Reference 1, STP Nuclear Operating Company (STPNOC) submitted a License Renewal Application (LRA). Reference 2 provided the NRC with changes made by STPNOC to the Selective Leaching of the Aluminum Bronze Program (AMP). In References 3, 4, and 5, the NRC and STPNOC discussed clarifications to the changes made to the Selective Leaching of the Aluminum Bronze, 10 CFR Part 50, Appendix J programs, and Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. Enclosure 1 to this letter provides supplemental information regarding STPNOC's Selective Leaching of the Aluminum Bronze, 10 CFR Part 50, Appendix J, and Regulatory Guide 1.127 programs. Enclosure 2 provides line in/line out revisions to the License Renewal Application.

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NRR

STI: 34363098

Regulatory commitment item 44 in LRA Table A4-1 has been revised as provided in Enclosure 3.

There are no other commitments in this letter.

If there are any questions regarding this submittal, please contact Arden Aldridge, STP License Renewal Project Lead, at (361) 972-8243 or Rafael Gonzales, STP License Renewal Project regulatory point-of-contact, at (361) 972-4779.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 09/28/16
Date

James Connolly
Site Vice President

rjg

Enclosures:

1) STPNOC LRA Supplemental Information
2) STPNOC LRA Appendix A and B Line in/out Sections
3) STPNOC Regulatory Commitments Replacement of Commitments 26 and 44 line in/out

cc:
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Enclosure 1

STPNOC LRA Supplemental Information

Discussion Topic 1:

Background

As modified by letter dated July 28, 2016, the "corrective actions" program element of the Selective Leaching of Aluminum Bronze program states that a structural integrity evaluation will be performed if: (a) there is a through-wall leak of an above or below ground weld; (b) an aluminum bronze weld is found to have an indication that does not meet acceptance criteria; or (c) a destructive examination does not meet acceptance criteria. The structural integrity evaluation is performed in order to confirm that the load carrying capacity of the welds remain adequate to support the intended function of the essential cooling water (ECW) system.

Issue

Beyond stating that an AMP effectiveness evaluation will be conducted, there are no specific corrective actions for when the result of the structural integrity evaluation is not acceptable. The staff recognizes that in most cases the degraded weld would have already been replaced prior to the structural integrity evaluation being conducted (e.g., a destructive examination does not meet acceptance criteria). However, numerous susceptible welds will still be present in the system that also might not meet structural integrity requirements.

Request

Modify LRA Sections A1.37 and B2.1.37 to state the specific corrective actions that will be taken if the results of a structural integrity evaluation are not acceptable.

STPNOC Response

LRA Appendix A1.37 and B2.1.37 are revised to provide the following specific corrective actions that will be taken if the results of a structural integrity evaluation are not acceptable.

If structural integrity evaluation is not acceptable:

- Perform a determination of operability.
- Perform extent of condition evaluation to determine the cause of the structural integrity evaluation failure and identify other locations requiring examination. These additional examinations will focus on stress margin locations less than or equal to that of the structurally unacceptable weld.
- Perform monthly aboveground walkdowns of the aluminum bronze welds to verify no through-wall leakage is occurring.
- Perform monthly yard walkdowns to verify no through-wall leakage is occurring.
- Perform volumetric examination of an additional 25 above ground welds within the next six months to look for cracking.
- Perform five additional volumetric examinations for each weld found with a weld indication not meeting the acceptance criteria until no additional weld indication not meeting the acceptance criteria is found.
- Determine a repair or replacement program of susceptible weld(s) based on the cause of the structural integrity evaluation failure, results of the additional volumetric examinations and the extent of condition.

Enclosure 2 provides the line-in/line-out revision to LRA Appendix A1.37 and B2.1.37.

Enclosure 3 provides the line-in/line-out revision to LRA Table A4-1 Commitment 44.

Discussion Topic 2:

Background

As modified by letter dated July 28, 2016, the Selective Leaching of Aluminum Bronze AMP "acceptance criteria" program element states, in part, that:

> The acceptance criterion for destructive examinations is no loss of material due to selective leaching penetrating 80% of the root-pass region and non-propagating (surrounded by a resistant phase distribution). The microstructure of the weld root region exhibits a non-continuous phase distribution consistent with the metallurgical technical basis report.

As modified by letter dated July 28, 2016, the Selective Leaching of Aluminum Bronze AMP "corrective actions" program element states, in part, that when, "[a} destructive examination does not meet acceptance criteria. Perform five additional destructive examinations until no unacceptable selective leaching is found to assess extend of condition and cause."

Issue

It is unclear if the acceptance criteria for destructive examinations includes phase distribution. The corrective actions and expansion criteria associated with not meeting the phase distribution acceptance criteria are unclear.

There are statements in the UFSAR Supplement, AMP program elements, and Commitment No. 44 that are potentially inconsistent and could lead a reviewer to conclude that microstructure acceptance criteria will not be applied, such as:

- LRA Section A1.37, seventh paragraph: "[i]selective leaching that does not meet the acceptance criteria is found, periodic destructive examinations of 20 percent with a maximum of 25 welds of the above ground weld population with no backing rings and 20 percent with a maximum of 25 welds of the above ground weld population with backing rings will be performed every 10 years thereafter."

- LRA Section A1.37, eighth paragraph: "[d]iscovery of unacceptable selective leaching requires five additional destructive examinations to be performed until no unacceptable selective leaching is found."

- LRA Section B2.1.37, Program Description, seventh paragraph: "[i]f selective leaching that does not meet the acceptance criteria is found, periodic destructive examinations of...."

- LRA Section B2.1.37, Program Description, eighth paragraph: "[d]iscovery of unacceptable selective leaching requires five additional destructive examinations to be performed until no unacceptable selective leaching is found.

- LRA Section B2.1.37, "parameters monitored or inspected" program element, second to last paragraph: "[a]n aluminum bronze welds found to have an indication that does not meet the acceptance criteria or has through wall leakage is removed and destructively examined to determine extent of cracks and/or selective leaching."

In addition, the "corrective actions" program element includes several statements related to determining "the extent of cracks or selective leaching," or associated with conducting additional destructive examinations, "until no unacceptable selective leaching is found..." Each of the above statements do not cite the phase distribution of the weld as a factor in evaluating the condition or as an acceptance criteria.

Based on its review of the "acceptance criteria" program element, the staff is unable to determine if phase distribution is part of the acceptance criteria. Based on the above examples, it does not appear that phase distribution acceptance criterion has been incorporated into the appropriate program elements, UFSAR Supplement, or commitments.

Request

a. Clearly state the acceptance criteria associated with destructive examinations and if it includes phase distribution.

b. State the acceptance criteria associated with phase distribution. Specify when the acceptance criteria associated with phase distribution is applicable.

c. State the corrective actions and expansion criteria associated with the phase distribution acceptance criteria.

d. Revise LRA Sections A1.37, B2.1.37, and Commitment No. 44 to appropriately cite the acceptance criterion, corrective actions, and expansion criteria related to phase distribution.

STPNOC Response

a. The acceptance criteria associated with destructive examinations is revised to clearly state the acceptance criteria includes phase distribution.

   The following is the acceptance criteria for destructive examinations.

   1) No loss of material due to selective leaching penetrating 80% of the root-pass region.
   2) Found selective leaching is non-propagating (surrounded by a non-continuous phase distribution).
   3) The microstructure of the weld root region shall exhibit a non-continuous phase distribution consistent with the metallurgical technical basis report.

b. The acceptance criterion associated with phase distribution (destructive examination) is a microstructure that exhibits a non-continuous phase distribution consistent with the metallurgical technical basis report. The acceptance criterion for phase distribution is applicable when performing the destructive examinations.

c. The corrective actions and expansion criteria associated with the phase distribution (destructive examination) is:
   - Perform five additional destructive examinations until no unacceptable selective leaching or non-continuous microstructure phase distribution is found to assess extent of condition and cause.
   - Perform a structural integrity evaluation to confirm that the load carrying capacity of the installed welds remains adequate to support the intended function of the ECW system through the period of extended operation.
   - Perform an AMP effectiveness evaluation to determine program changes required to manage the aging mechanism.

d. LRA Sections A1.37, B2.1.37, and Commitment No. 44 are revised to cite the acceptance criterion, corrective actions, and expansion criteria related to phase distribution by including microstructure phase distribution when performing destructive examination.

Enclosure 2 provides the line-in/line-out revision to LRA Appendix A1.37 and B2.1.37.

Enclosure 3 provides the line-in/line-out revision to LRA Table A4-1 Commitment 44.

Discussion Topic 3:

Background

As modified by letter dated July 28, 2016, the "parameters monitored and inspected" program element of the Selective Leaching of Aluminum Bronze program states that the welds subject to volumetric examination will be selected based on, "construction and size distributions." This program element also states that the welds subject to destructive examination will be randomly selected.

Issue

A basis was not provided for why the welds subject to destructive examination will be randomly selected. Parameters that could impact the susceptibility of the final weld properties should be considered.

Request

State the basis for randomly selecting the welds subject to destructive examination.

STPNOC Response

LRA Appendix B2.1.37, and Table A4-1, Commitment 44, are revised to state that construction and size distributions are considered when randomly selecting the welds subject to destructive examination.

Enclosure 2 provides the line-in/line-out revision to LRA Appendix B2.1.37.

Enclosure 3 provides the line-in/line-out revision to LRA Table A4-1 Commitment 44.

Discussion Topic 4:

Background

Enclosure 1 of the letter dated July 28, 2016, describes how the extruded tee weld repair sizes will be characterized.

Issue

The "scope of program" program element of the Selective Leaching of Aluminum Bronze program does not include how the extruded tee weld repair sizes will be characterized.

Request

Revise LRA Section B2.1.37 to incorporate how the extruded tee weld repair sizes will be characterized.

STPNOC Response

LRA Appendix B2.1.37 is revised to incorporate how the extruded tee weld repair sizes will be characterized.

Enclosure 2 provides the line-in/line-out revision to LRA Appendix B2.1.37.

Discussion Topic 5:

Background

As modified by letter dated July 28, 2016, the procedures associated with the "detection of aging effects" will be enhanced to require that a volumetric examination be conducted to determine if loss of material or cracking has occurred in the vicinity of degraded coatings on buried ECW piping. The volumetric examinations is also cited in Commitment No. 39.

Issue

It is not clear to the staff how loss of material due to selective leaching will be detected by volumetric inspections. In addition, the staff noted that there is no acceptance criteria for the extent of loss of material due to selective leaching of the external surfaces of buried ECW piping.

Request

a. State the basis for how the extent of loss of material due to selective leaching will be adequately detected by volumetric examination methods or state how the loss of material will be quantified.

b. State the acceptance criteria for the extent of loss of material due to selective leaching of the external surfaces of buried ECW piping.

STPNOC Response

a) The STP response dated July 28, 2016 (Reference 2) listed loss of material as an aging effect that is detected using volumetric examination for the buried ECW piping in the vicinity of degraded coatings. The volumetric examination is used to detect cracking, not loss of material. An external surface examination capable of detecting selective leaching will be performed on the external surface of the buried ECW piping welds in the vicinity of degraded coatings to detect loss of material due to selective leaching.

b) The acceptance criterion for extent of loss of material on the external surface is that upon removal of the selective leaching, the minimum wall thickness is maintained.

Corrective action such as surface conditioning is performed until no selective leaching is detected. If unacceptable wall thickness is found following surface conditioning, the buried ECW piping is repaired or replaced.

Enclosure 2 provides the line-in/line-out revision to LRA Appendix B2.1.37.

Discussion Topic 6:

Background

As modified by letter dated July 28, 2016, LRA Section A1.37 states that visual inspections will be conducted every six months, not to exceed nine months. LRA Section B2.1.37 states that visual inspections will be conducted every six months.

Issue

The UFSAR Supplement and Selective Leaching of Aluminum Bronze program are inconsistent.

Request

Revise the UFSAR Supplement or Selective Leaching of Aluminum Bronze program to be consistent in regard to the interval between visual inspections.

STPNOC Response

LRA Section A1.37 is revised to delete "(not to exceed nine months)".

Enclosure 2 provides the line-in/line-out revision to LRA Appendix A.1.37.

Clarification to AMP B2.1.30 10 CFR Part 50, Appendix J

The NRC held a telephone conference on August 11, 2016, to clarify changes made to the Title 10, Part 50 of the Code of Federal Regulation (CFR), Appendix J, "Primary Reactor Containment Leakage Testing for Water- Cooled Power Reactors," Aging Management Program.

Background:

By letter dated October 25, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML103010256), South Texas Project (STP) Nuclear Operating Company (STPNOC), submitted a License Renewal Application (LRA) pursuant to Title 10 of the Code of Federal Regulations (CFR) Part 54 for review by the U.S. Nuclear Regulatory Commission (NRC or the staff), to renew operating licenses NPF-76 and NPF-80 for South Texas Project, Units 1 and 2, for an additional 20 years.

In accordance with Section 54.12(b) of 10 CFR, by letter dated June 28, 2016 (ADAMS Accession No. ML16190A135), the applicant submitted an LRA update covering the period from September 1, 2015 through June 29, 2016. The NRC staff is in the process of reviewing the 2016 LRA update and sought clarification to the 10 CFR 50, Appendix J Program.

Discussion:

The NRC staff began the discussion by stating that there were no clarification questions regarding Regulatory Guide 1.35, "Inservice Inspection of Ungrouted Tendons in Prestressed Concrete Containments."

The NRC staff and the applicant discussed the following clarifications:

1. 10 CFR 50, Appendix J Program Exception to NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," (the GALL Report)

   The staff noted that in the 2016 Annual Update, the applicant identified an exception to the GALL Report for the 10 CFR 50, Appendix J Program. However, the applicant did not identify the program elements to which the exception applied.

The applicant acknowledged that the 2016 Annual Update did not identify the program elements and agreed to provide an amendment to the LRA identifying the program elements to which the exception applied.

STPNOC Response

LRA Appendix B2.1.30 is revised to specify the program element for each exception taken to NUREG-1801, Rev. 1 for the 10 CFR 50, Appendix J Program XI.S4.

Enclosure 2 provides the line-in/line-out revision to LRA Appendix B2.1.30.

NRC Region IV Inspection Item

During the NRC Region IV License Renewal inspection, the NRC inspection team identified that the seepage rate evaluation described in the Updated Final Analysis Report is inconsistent with the monitoring described in the License Renewal application, Reference 1. STP no longer uses the Specification for Geotechnical Monitoring by monitoring the benchmarks in the emergency cooling pond as described in the License Renewal application, Reference 1.

STPNOC Response

To address this concern, Appendices A1.33, and B2.1.33 and AMP basis document RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants, is revised to clarify the Essential Cooling Pond monitoring and inspections. The reference to the use of monitoring benchmarks and piezometers in the emergency cooling pond has been removed. Benchmarks are used to monitor the settlement of the Essential Cooling Water intake and discharge structures and the buried portion of the Essential Cooling Water pipes. Additional, monitoring of sediment accumulation is revised to use soundings.

Enclosure 2 provides the line-in/line-out revision to LRA Appendix A1.33 and B2.1.33.

Enclosure 2

STPNOC LRA Appendix A and B Line in/out Sections

Affected LRA Section
A1.33
A1.37
B2.1.37
B2.1.30
B2.1.33

A1.33 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program manages cracking, loss of bond, loss of material (spalling, scaling), cracking due to expansion, increase in porosity and permeability, loss of strength, and loss of form by performing inspection and surveillance activities for the Essential Cooling Water (ECW) Intake, and Discharge ~~all~~ water control structures associated with emergency cooling water systems. ~~The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program, which is implemented as part of the Structures Monitoring Program (SMP).~~ STP is committed to conform to the intent of RG 1.127 with respect to the essential cooling pond (ultimate heat sink). The Structures Monitoring Program includes ~~all~~ the ECW Intake and Discharge structures ~~water control structures,~~ which are within the scope of RG 1.127, as evaluated in NUREG-1801. The essential cooling pond, the ~~essential cooling water~~ ECW ~~pond~~ Intake structure, and the ECW ~~essential cooling pond~~ Discharge structure are ~~the water control structures~~ within the scope of license renewal that are monitored by this aging management program. Monitoring of structure settlement includes measurements of benchmark elevations on the ECW Intake and Discharge structures and elevations along the route of the buried portion of the Essential Cooling Water pipes. The essential cooling pond (ultimate heat sink) receives periodic monitoring of its hydraulic and structural condition, which includes inspection ~~evaluation~~ of erosion inhibiting structures, ~~conditions of benchmarks and piezometers, and measuring the essential cooling pond volume as indicative of any~~ monitoring of sediment accumulation, and seepage rate evaluation. Inspections of the essential cooling pond and ECW Intake and Discharge structures are performed every five years. ~~Except~~ Sediment monitoring using soundings, ~~which~~ is performed every ten years.

A1.37 SELECTIVE LEACHING OF ALUMINUM BRONZE

The Selective Leaching of Aluminum Bronze program manages loss of material and cracking due to selective leaching of aluminum bronze (copper alloy with greater than 8 percent aluminum) components and welds exposed to raw water within the scope of license renewal. The program also validates phase distribution characteristics of the microstructure.

All aluminum bronze castings susceptible to selective leaching, including attachment welds related to the castings, and aluminum bronze root valves with adapter socket welds will be replaced prior to the period of extended operation with material that is not susceptible to selective leaching. Extruded piping tees with aluminum bronze weld repairs, where the repair size is such that failure of the repair would affect the structural integrity of the component, will be replaced prior to the period of extended operation.

STP uses copper alloy piping with less than 8 percent aluminum content, which is not susceptible to selective leaching. However, there are welds in which the filler metal is copper alloy with greater than 8 percent aluminum. The final composition of welds and process used to fabricate the welds results in a reduction in the susceptibility of the root pass filler material to selective leaching.

The Selective Leaching of Aluminum Bronze program directs that prior to the period of extended operation 20 percent with a maximum of 25 welds of the above ground weld population with no backing rings are examined one-time volumetrically to manage cracking. If a weld indication that does not meet the acceptance criteria is found during the one-time inspection of welds with no backing rings, periodic volumetric examinations of 20 percent with a maximum of 25 welds will be performed every 10 years thereafter.

The Selective Leaching of Aluminum Bronze program directs that 20 percent with a maximum of 25 welds of the above ground weld population with backing rings are examined volumetrically to manage cracking prior to the period of extended operation and every 10 years thereafter.

Discovery of a weld indication that does not meet the acceptance criteria requires expansion of the volumetric examination sample population. Each weld found with a weld indication ~~that does~~ not meeting the acceptance criteria requires five additional volumetric examinations to be performed until no additional weld indication ~~that does~~ not meeting the acceptance criteria is found.

The Selective Leaching of Aluminum Bronze program directs that prior to the period of extended operation 20 percent with a maximum of 25 welds of the above ground weld population with no backing rings and 20 percent with a maximum of 25 welds of the above ground weld population with backing rings be examined one-time destructively to detect loss of material due to selective leaching and verify microstructure phase distribution. If selective leaching or microstructure phase distribution that does not meet the acceptance criteria ~~is~~ are found, periodic destructive examinations of 20 percent with a maximum of 25 welds of the above ground weld population with no backing rings and 20 percent with a maximum of 25 welds of the above ground weld population with backing rings will be performed every 10 years thereafter.

Discovery of unacceptable selective leaching or continuous microstructure phase distribution requires five additional destructive examinations to be performed until no unacceptable selective leaching or non-continuous microstructure phase distribution ~~is~~ are found.

Yard walkdowns are performed in the areas above the buried piping with aluminum bronze welds to look for changes in ground conditions that would indicate leakage. If a leak from a buried pipe weld is discovered by surface water monitoring or during a buried ECW piping inspection, a section of each leaking piping weld will be removed for destructive examination. Visual inspections are performed every six months ~~(not to exceed nine months)~~ of the external surfaces of the above ground welds for evidence of through wall leakage.

The Buried and Underground Piping and Tank program, B2.1.18, includes the visual inspection of the buried aluminum bronze exterior pipe coatings for visible breaks, gaps, and discontinuities which could indicate cracking of the welds and defines the acceptance criterion for buried pipe coatings.

The acceptance criterion for volumetric examination of aluminum bronze welds is no detected planar indication that is surface connected (exposed to the ECW environment) unless the depth of the indication is contained within the 80% of the weld root pass region. An indication not connected to the surface (not exposed to the ECW environment) is acceptable.

The acceptance criterion for visual inspection of the aluminum bronze welds and adjacent copper alloy piping during the walkdowns is no through wall leakage.

The acceptance criteria~~on~~ for destructive examinations ~~is~~ are:

1. No loss of material due to selective leaching penetrating 80% of the root-pass region.
2. Found selective leaching is ~~and~~ non-propagating (surrounded by a non-continuous ~~resistant~~ phase distribution).
3. The microstructure of the weld root region shall exhibits a non-continuous phase distribution consistent with the metallurgical technical basis report.

The acceptance criterion for buried aluminum bronze exterior pipe coating is defined in the Buried Piping and Tanks Inspection Aging Management Program B2.1.18. An external surface examination capable of detecting selective leaching will be performed on the buried ECW piping welds in the vicinity of degraded coatings to detect loss of material due to selective leaching. The acceptance criterion for extent of loss of material on the external surface is that upon removal of the selective leaching the minimum wall thickness is maintained. Corrective action (e.g., surface conditioning) is performed until no selective leaching is detected. If unacceptable wall thickness is found following surface conditioning, the buried ECW piping is repaired or replaced.

An aluminum-bronze weld found to have an indication that does not meet the acceptance criteria or has through wall leakage is removed and destructively examined to determine the extent of cracks, ~~and/or~~ extent of selective leaching and the microstructure phase distribution. The condition is documented in the corrective action program and a structural integrity analysis is performed to confirm that the load carrying capacity of the installed welds remain adequate to support the intended function of the ECW system through the period of extended operation.

An unacceptable structural integrity evaluation requires:

1. A determination of operability.
2. An extent of condition evaluation to determine the cause of the structural integrity evaluation failure and identify other locations requiring examination.
3. Monthly aboveground walkdowns of the aluminum bronze welds.
4. Monthly yard walkdowns to verify no through-wall leakage is occurring.
5. Volumetric examination of an additional 25 above ground welds within the next six months to look for cracking.
6. Five additional volumetric examinations for each weld found with a weld indication not meeting the acceptance criteria until no additional weld indication not meeting the acceptance criteria is found.
7. A repair or replacement program of the susceptible weld(s).

B2.1.37 Selective Leaching of Aluminum Bronze

Program Description

The Selective Leaching of Aluminum Bronze program manages loss of material and cracking due to selective leaching for aluminum bronze (copper alloy with greater than eight percent aluminum) components and welds exposed to raw water within the scope of license renewal. The program also validates phase distribution characteristics of the microstructure. The selective leaching of aluminum bronze is applied in addition to the Open-Cycle Cooling Water program (B2.1.9).

All aluminum bronze castings susceptible to selective leaching, including attachment welds related to the castings and aluminum bronze root valve adapter socket welds, will be replaced prior to the period of extended operation with material that is not susceptible to selective leaching. Extruded piping tees with aluminum bronze weld repairs, where the repair size is such that failure of the repair would affect the structural integrity of the component, will be replaced prior to the period of extended operation.

STP uses copper alloy piping with less than 8 percent aluminum content, which is not susceptible to selective leaching. However, there are welds in which the filler metal is copper alloy with greater than 8 percent aluminum. The final composition of welds and process used to fabricate the welds results in a reduction in the susceptibility of the root pass filler material to selective leaching.

The Selective Leaching of Aluminum Bronze program directs that prior to the period of extended operation 20 percent with a maximum of 25 welds of the above ground weld population with no backing rings are examined one-time volumetrically to manage cracking. If a weld indication that does not meet the acceptance criteria is found during the one-time inspection of welds with no backing rings, periodic volumetric examinations of 20 percent with a maximum of 25 welds will be performed every 10 years thereafter.

The Selective Leaching of Aluminum Bronze program directs that 20 percent with a maximum of 25 welds of the above ground weld population with backing rings are examined volumetrically to manage cracking prior to the period of extended operation and every 10 years thereafter.

Discovery of a weld indication that does not meet the acceptance criteria requires expansion of the volumetric examination sample population. Each weld found with a weld indication ~~that does~~ not meeting the acceptance criteria requires five additional volumetric examinations to be performed until no additional weld indication ~~that does~~ not meeting the acceptance criteria is found.

The Selective Leaching of Aluminum Bronze program directs that prior to the period of extended operation 20 percent with a maximum of 25 welds of the above ground weld population with no backing rings and 20 percent with a maximum of 25 welds of the above ground weld population with backing rings be examined one-time destructively to detect loss of material due to selective leaching and verify microstructure phase distribution. If selective leaching or microstructure phase distribution that does not meet the acceptance criteria ~~is~~ are found, periodic destructive examinations of 20 percent with a maximum of 25 welds of the above ground weld population with no backing rings and 20 percent with a maximum of 25 welds of the above ground weld population with backing rings will be performed every 10 years thereafter.

Discovery of unacceptable selective leaching or continuous microstructure phase distribution requires five additional destructive examinations to be performed until no unacceptable selective leaching or non-continuous microstructure phase distribution are ~~is~~ found.

Yard walkdowns are performed in the areas above the buried piping with aluminum bronze welds to look for changes in ground conditions that would indicate leakage. If a leak from a buried pipe weld is discovered by surface water monitoring or during a buried ECW piping inspection, a section of each leaking piping weld will be removed for destructive examination. Visual inspections are performed every six months of the external surfaces of the above ground welds for evidence of through wall leakage.

The Buried and Underground Piping and Tank program, B2.1.18, includes the visual inspection of the buried aluminum bronze exterior pipe coatings for visible breaks, gaps, and discontinuities which could indicate cracking of the welds.

The acceptance criterion for volumetric examination of aluminum bronze welds is no detected planar indication that is surface connected (exposed to the ECW environment) unless the depth of the indication is contained within the 80% of the weld root pass region. An indication not connected to the surface (not exposed to the ECW environment) is acceptable.

The acceptance criterion for visual inspection of the aluminum bronze welds and adjacent copper alloy piping during the walkdowns is no through wall leakage.

The acceptance criteria~~on~~ for destructive examinations are ~~is~~:

1. No loss of material due to selective leaching penetrating 80% of the root-pass region.
2. Found selective leaching is and non-propagating (surrounded by a non-continuous resistant phase distribution).
3. The microstructure of the weld root region shall exhibits a non-continuous phase distribution consistent with the metallurgical technical basis report.

The acceptance criterion for buried aluminum bronze exterior pipe coating is defined in the Buried Piping and Tanks Inspection Aging Management Program B2.1.18. An external surface examination capable of detecting selective leaching will be performed on the buried ECW piping welds in the vicinity of degraded coatings to detect loss of material due to selective leaching. The acceptance criterion for extent of loss of material on the external surface is that upon removal of the selective leaching the minimum wall thickness is maintained. Corrective action, such as surface conditioning, is performed until no selective leaching is detected. If unacceptable wall thickness is found following surface conditioning, the buried ECW piping is repaired or replaced.

An aluminum bronze weld found to have an indication that does not meet the acceptance criteria or has through wall leakage is removed and destructively examined to determine ~~the~~ extent of cracks, ~~and/or~~ extent of selective leaching, and the microstructure phase distribution. The condition is documented in the corrective action program and a structural integrity analysis is performed to confirm that the load carrying capacity of the installed welds remain adequate to support the intended function of the ECW system through the period of extended operation.

An unacceptable structural integrity evaluation requires:

- A determination of operability.
- An extent of condition evaluation to determine the cause of the structural integrity evaluation failure and identify other locations requiring examination.
- Monthly aboveground walkdowns of the aluminum bronze welds.
- Monthly yard walkdowns to verify no through-wall leakage is occurring.
- Volumetric examination of an additional 25 above ground welds within the next six months to look for cracking.
- Five additional volumetric examinations for each weld found with a weld indication not meeting the acceptance criteria until no additional weld indication not meeting the acceptance criteria is found.
- A repair or replacement program of the susceptible weld(s).

Aging Management Program Elements

An evaluation of each element of the Aging Management Program against the 10 elements described in Appendix A of NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, is provided below.

Scope of Program (Element 1)

The Selective Leaching of Aluminum Bronze program manages loss of material and cracking due to selective leaching for aluminum bronze (copper alloy with greater than 8 percent aluminum) components and welds exposed to raw water within the scope of license renewal.

Prior to the period of extended operation, all aluminum bronze castings susceptible to loss of material due to selective leaching, including attachment welds related to the castings and aluminum bronze root valves with adapter socket welds, will be replaced with material that is not susceptible to selective leaching.

Extruded piping tees with aluminum bronze weld repairs are characterized using the following techniques:

1. The vendor Record of Nonconformance is evaluated; or
2. Where insufficient information is available, then past radiography film is used to determine the limiting size of the weld repair by measuring the size of the area of interest on the film; or
3. Where past radiography film is not available, radiography will be performed to characterize the weld repair. Extrapolation during sizing of the weld repair is not performed. Where the repair size is such that failure of the repair would affect the structural integrity of the component, the component will be replaced prior to the period of extended operation.

STP uses copper alloy piping with less than 8 percent aluminum, which is not susceptible to selective leaching. However, welds in which the filler metal is copper alloy with greater than 8 percent aluminum may be susceptible to loss of material and cracking due to selective leaching. The final composition of welds and process used to fabricate the welds results in a reduction in the susceptibility of the root pass filler material to selective leaching.

The following weld material is used.

- ERCuAl-A2 with no backing ring,
- ERCuNiAl with no backing ring,
- ERCuAl-A2 with backing ring, and
- ERCuAl-A2 non-cast component weld repairs.

Preventive Actions (Element 2)

The Selective Leaching of Aluminum Bronze program does not prevent degradation due to aging effects but provides for component replacement and inspections to detect aging degradation prior to the loss of intended functions.

External surfaces of the buried aluminum bronze piping are coated to prevent selective leaching of the exterior surface of the aluminum bronze welds. The above ground piping is not coated.

Parameters Monitored or Inspected (Element 3)

The susceptibility of aluminum bronze welds is related to the integrity of the weld, the weld material composition, and the welding temperature controls.

Loss of material due to selective leaching is monitored through system walkdowns and destructive examinations.

Cracking associated with selective leaching is monitored through volumetric examination and destructive examination.

Phase distribution to verify the potential for continuous selective leaching is monitored through destructive examination.

Welds without backing rings are either original ERCuAl-A2 material or replacement ERCuNiAl material. The original ERCuAl-A2 welds without backing rings were radiographed at time of installation to detect the presence of weld flaws. The replacement ERCuNiAl welds without backing rings were examined visually and by liquid penetrant method at time of installation. The ERCuNiAl weld material is less susceptible to selective leaching than the ERCuAl-A2 weld material due to the addition of nickel.

Welds with backing rings are original ERCuAl-A2 material. The original ERCuAl-A2 welds with backing rings were examined visually and by use of liquid penetrant method at time of installation.

The aging management program will manage cracking of the above ground weld population with no backing rings by performing a one-time volumetric examination on 20 percent with a maximum of 25 welds prior to the period of extended operation. If a weld indication that does not meet the acceptance criteria is found during the one-time inspection of welds with no backing rings, periodic volumetric examinations of 20 percent with a maximum of 25 welds will be performed every 10 years thereafter.

The aging management program will manage cracking of the above ground weld population with backing rings by performing periodic volumetric examinations on 20 percent with a maximum of 25 welds prior to the period of extended operation and every 10 years thereafter.

Since the population of welds use similar material and are exposed to the same environment, the samples for volumetric examination will be randomly selected from the total population of welds, considering construction and size distributions. The above ground welds are used as the bounding condition to represent both the above and below ground welds when performing the volumetric examination.

The aging management program will manage loss of material due to selective leaching and verify microstructure phase distribution of the above ground weld population with and without backing rings by performing a one-time destructive examination on 20 percent with a maximum of 25 welds with backing rings and 20 percent with a maximum of 25 welds without backing rings prior to the period of extended operation. If selective leaching or microstructure phase distribution that does not meet the acceptance criteria ~~is~~ are found, periodic destructive examinations of 20 percent with a maximum of 25 welds will be performed every 10 years thereafter.

Since destructive examinations ~~is~~ are used to verify the susceptibility of the weld to selective leaching, the samples for the sample population will be randomly selected from the total population of welds with and without backing rings, considering construction and size distributions.

Periodic walkdowns of the above ground piping, components and welds is performed to verify no through wall leakage.

Periodic walkdowns of the yard areas over the buried ECW piping and welds is performed to verify no evidence of through wall leakage.

An aluminum bronze weld found to have an indication that does not meet the acceptance criteria or has through wall leakage is removed and destructively examined to determine extent of cracks, ~~and/or~~ extent of selective leaching, and the microstructure phase distribution. The condition is documented in the corrective action program and a structural integrity analysis is performed to confirm that the load carrying capacity of the installed welds remain adequate to support the intended function of the ECW system through the period of extended operation.

The Buried and Underground Piping and Tank program, B2.1.18, includes the visual inspection of the buried aluminum bronze exterior pipe coatings for visible breaks, gaps, and discontinuities which could indicate possible cracking of the welds. An external surface examination capable of detecting selective leaching will be performed on the buried ECW piping welds in the vicinity of degraded coatings to detect loss of material due to selective leaching.

Detection of Aging Effects (Element 4)

The Selective Leaching of Aluminum Bronze program includes one-time and periodic volumetric and destructive examinations of aluminum bronze welds to determine if loss of material and cracking due to selective leaching is occurring.

The Selective Leaching of Aluminum Bronze program includes visual inspections every six months of the external surfaces of the above ground components and welds for evidence of through wall leakage.

Every six months, a walkdown is performed in the areas above the buried ECW piping containing copper alloy welds with aluminum content greater than 8 percent. During the

walkdown, the ground is observed for conditions that would indicate leakage. If a leak from a below-grade piping weld is discovered by surface water monitoring, a section of each leaking piping weld will be removed for destructive examination.

The Buried and Underground Piping and Tank program, B2.1.18, specifies that whenever aluminum bronze materials are exposed during inspection of the buried ECW piping, the exterior pipe coating is inspected for degradation. If degradation is identified near a weld a volumetric examination will be performed to determine if cracking of the weld is occurring. An external surface examination capable of detecting selective leaching will be performed on the buried ECW piping welds in the vicinity of degraded coatings to detect loss of material due to selective leaching.

If leaking below-grade welds are discovered during a buried ECW piping inspection, a section of each leaking weld will be removed for destructive examination.

An aluminum bronze weld found to have an indication that does not meet the acceptance criteria or has through wall leakage is removed and destructively examined to determine extent of loss of material, ~~and/or~~ extent of cracking due to selective leaching, and the microstructure phase distribution.

Monitoring and Trending (Element 5)

This is an inspection program to determine if selective leaching is occurring and the degree of the selective leaching.

STP will maintain the history of the volumetric and destructive examinations results. Following completion of the volumetric and destructive examinations scope, a review is performed to identify potential adverse trends or other indications requiring action.

Acceptance Criteria (Element 6)

The acceptance criterion for volumetric examination of aluminum bronze welds is no detected planar indication that is surface connected (exposed to the ECW environment) unless the depth of the indication is contained within the 80% of the weld root pass region. An indication not connected to the surface (not exposed to the ECW environment) is acceptable.

The acceptance criterion for visual inspection of the aluminum bronze welds and adjacent copper alloy piping during the walkdowns is no through wall leakage.

The acceptance criteria~~on~~ for destructive examinations ~~is~~ are:

1. No loss of material due to selective leaching penetrating 80% of the root-pass region.
2. Found selective leaching is non-propagating (surrounded by a non-continuous resistant phase distribution).
3. The microstructure of the weld root region shall exhibits a non-continuous phase distribution consistent with the metallurgical technical basis report.

The acceptance criterion for buried aluminum bronze exterior pipe coating is defined in the Buried Piping and Tanks Inspection Aging Management Program B2.1.18. The acceptance

criterion for extent of loss of material on the external surface of buried aluminum bronze piping with coating degradation is that upon removal of the selective leaching the minimum wall thickness is maintained.

If an acceptance criterion is not met, the condition is documented in the corrective action program.

Corrective Actions (Element 7)

The following corrective actions are performed when acceptance criteria are not met:

A through wall leak of the above or below ground weld.

- Remove weld and destructively examined to determine the extent of cracks, ~~or~~ extent of selective leaching, and the microstructure phase distribution.
- Perform five additional volumetric inspections to assess extent of condition and cause.
- Perform a structural integrity evaluation to confirm that the load carrying capacity of the installed welds remain adequate to support the intended function of the ECW system through the period of extended operation.
- Replace leaking weld
- Perform an AMP effectiveness evaluation to determine program changes required to manage the aging.

An aluminum bronze weld found to have an indication that does not meet the acceptance criteria.

- Remove weld and destructively examined to determine the extent of cracks, ~~or~~ extent of selective leaching, and the microstructure phase distribution.
- Perform five additional volumetric examinations until no additional weld indication ~~that does~~ not meeting the acceptance criteria ~~defects are~~ is found to assess extent of condition and cause.
- Perform a structural integrity evaluation to confirm that the load carrying capacity of the installed welds remain adequate to support the intended function of the ECW system through the period of extended operation.
- Perform an AMP effectiveness evaluation to determine program changes required to manage the aging.
- Replace weld

A destructive examination does not meet acceptance criteria.

- Perform five additional destructive examinations until no unacceptable selective leaching or non-continuous microstructure phase distribution ~~is~~ are found to assess extent of condition and cause.
- Perform a structural integrity evaluation to confirm that the load carrying capacity of the installed welds remain adequate to support the intended function of the ECW system through the period of extended operation.
- Perform an AMP effectiveness evaluation to determine program changes required to manage the aging.

If structural integrity evaluation is determined to be unacceptable:

- Perform a determination of operability.
- Perform extent of condition evaluation to determine the cause of the structural integrity evaluation failure and identify other locations requiring examination. These additional examinations will focus on stress margin locations less than or equal to that of the structurally unacceptable weld.
- Perform monthly aboveground walkdowns of the aluminum bronze welds to verify no through-wall leakage is occurring.
- Perform monthly yard walkdowns to verify no through wall leakage is occurring.
- Perform volumetric examination of an additional 25 above ground welds within the next six months to look for cracking.
- Perform five additional volumetric examinations for each weld found with a weld indication not meeting the acceptance criteria until no additional weld indication not meeting the acceptance criteria is found.
- Determine a repair or replacement program of the susceptible weld(s) based on the cause of the structural integrity evaluation failure, results of the additional volumetric examinations and the extent of condition.

The Buried Piping and Tanks Inspection Aging Management Program B2.1.18, outlines corrective actions resulting from the identification of degraded buried aluminum bronze exterior pipe coating. Corrective action for selective leaching found under degraded ECW buried piping coatings such as surface conditioning is performed until no selective leaching is detected. If unacceptable wall thickness is found following surface conditioning, the buried ECW piping is repaired or replaced.

STP QA procedures, review and approval process, and administrative controls are implemented in accordance with the requirements of 10 CFR 50 Appendix B and are acceptable in addressing corrective actions. The QA program includes elements of corrective action, and is applicable to the safety-related and nonsafety-related systems, structures, and components that are subject to aging management review.

Confirmation Process (Element 8)

STP QA procedures, review and approval process, and administrative controls are implemented in accordance with the requirements of 10 CFR 50 Appendix B and are acceptable in addressing confirmation processes and administrative controls. The QA program includes elements of corrective action, and is applicable to the safety-related and nonsafety-related systems, structures, and components that are subject to aging management review.

Administrative Controls (Element 9)

See Element 8.

Operating Experience (Element 10)

STP identified through-wall cracks in the ECW system piping which were initiated by pre-existing weld defects and propagated by a selective leaching phenomenon. The pre-existing weld defects identified appeared in welds with backing rings. The weld population consists of shop and field welds without backing rings, field welds with backing rings, weld repairs to extruded piping tees, and valves with adapter socket welds. Welds that have shown through-

wall cracks have been welds with backing rings, weld repairs to extruded piping tees, and valves with adapter socket welds. Laboratory failure analysis data has indicated that in the cases with leaks, a preexisting crack penetrating into the central core of the weld was present. Poor fit-up may have contributed to such root pass cracking. Crack growth appears to have occurred by a process of the crack tip selective leaching locally and the crack propagating through the selectively leached zone. The affected welds were repaired.

Selective leaching has occurred in susceptible aluminum bronze components. STP will replace all susceptible aluminum bronze components prior to the period of extended operation.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Scope of Program (Element 1) and Preventive Actions (Element 2)

Procedure will be enhanced to:

- Replace all aluminum bronze castings susceptible to selective leaching, including attachment welds with material that is not susceptible to selective leaching, prior to the period of extended operation.

- Replace aluminum bronze root valve adapter socket welds with material that is not susceptible to selective leaching prior to the period of extended operation.

- Replace extruded piping tees with aluminum bronze weld repairs where the repair size is such that failure of the repair would affect the structural integrity of the component prior to the period of extended operation.

Parameters Monitored or Inspected (Element 3)

Procedure will be enhanced to:

- Specify, loss of material due to selective leaching is monitored through system walkdowns and destructive examinations.

- Specify, cracking associated with selective leaching is monitored through volumetric examination and destructive examination.

- Specify, phase distribution to verify the potential for continuous selective leaching is determined through destructive examination.

- Verify, the management of cracking of the above ground weld population with no backing rings by performing a one-time volumetric examination on 20 percent with a maximum of 25 welds prior to the period of extended operation.

- Specify, if a weld indication that does not meet the acceptance criteria is found during the one-time inspection of weld with no backing rings, periodic volumetric examinations of 20 percent with a maximum of 25 welds will be performed every 10 years thereafter.

- Verify, the management of cracking of the above ground weld population with backing rings by performing periodic volumetric examinations on 20 percent with a maximum of 25 welds prior to the period of extended operation and every 10 years thereafter.

- Specify, the samples for volumetric examination be randomly selected from the total population of above ground welds, considering construction and size distributions.

- Verify, the management of selective leaching and microstructure phase distribution of the above ground weld population with and without backing rings by performing a one-time destructive examination on 20 percent with a maximum of 25 welds with backing rings and 20 percent with a maximum of 25 welds without backing rings prior to the period of extended operation.

- Specify, if selective leaching or microstructure phase distribution does not meet the acceptance criteria during the one-time destructive examinations, periodic destructive examinations of 20 percent with a maximum of 25 welds will be performed every 10 years thereafter.

- Require the sample population for destructive examinations be randomly selected from the total population of welds with and without backing rings, considering construction and size distributions.

- Require a weld which does not meet the acceptance criteria or has through wall leakage, be removed and destructively examined to determine the extent of cracks, or extent of selective leaching, and the microstructure phase distribution.

- Require a welds which does not meet the acceptance criteria or has through wall leakage be documented in the corrective action program and a structural integrity analysis be performed to confirm that the load carrying capacity of the installed welds remain adequate to support the intended function of the ECW system through the period of extended operation.

- Require an external surface examination capable of detecting selective leaching will be performed on the buried ECW piping welds in the vicinity of degraded coatings to detect loss of material due to selective leaching.

Detection of Aging Effects (Element 4)

Procedure will be enhanced to:

- Require one-time and periodic volumetric examination of above ground aluminum bronze welds to determine if loss of material due to selective leaching or cracking is occurring.

- Require one-time and periodic destructive examination of above ground aluminum bronze welds to determine if selective leaching is occurring and verify phase distribution.

- Require a weld which does not meet the acceptance criteria or has through wall leakage be removed and destructively examined to determine extent of cracks, and/or extent of selective leaching, and the microstructure phase distribution.

- Require whenever aluminum bronze materials are exposed during inspection of the buried ECW piping, the exterior aluminum bronze pipe coating is inspected for degradation. If degradation is identified near a weld, a volumetric examination will be performed to determine if ~~loss of material or~~ cracking due to selective leaching is occurring. An external surface examination capable of detecting selective leaching will be performed on the buried ECW piping welds in the vicinity of degraded coatings to detect loss of material due to selective leaching.

Monitoring and Trending (Element 5)

Procedure will be enhanced to:

- Require that the history of the volumetric and destructive examinations results be maintained and a review be performed to identify potential adverse trends or other indications requiring action.

Acceptance Criteria (Element 6)

Procedure will be enhanced to:

- Specify, the acceptance criterion for volumetric examination of aluminum bronze welds is no detected planar indication that is surface connected (exposed to the ECW environment) unless the depth of the indication is contained within the 80% of the weld root pass region. An indication not connected to the surface (not exposed to the ECW environment) is acceptable.

- Specify, the acceptance criterion for visual inspection of the aluminum bronze welds and adjacent copper alloy piping during the walkdowns is no through wall leakage.

- Specify, the acceptance criteria~~on~~ for destructive examinations ~~is~~ are:
  1. No loss of material due to selective leaching penetrating 80% of the root-pass region.
  2. Found selective leaching is and non-propagating (surrounded by a non-continuous resistant phase distribution).
  3. The microstructure of the weld root region shall exhibits a non-continuous phase distribution consistent with the metallurgical technical basis report.

- Require, if an acceptance criterion is not met, the unacceptable condition be documented in the corrective action program and a structural integrity analysis be performed to confirm that the load carrying capacity of the installed welds remain adequate to support the intended function of the ECW system through the period of extended operation.

- The acceptance criterion for extent of loss of material on the external surface of buried aluminum bronze piping with coating degradation is that upon removal of the selective leaching the minimum wall thickness is maintained.

Corrective Actions (Element 7)

Procedure will be enhanced to:

- Require, upon discovery of a weld which does not meet the acceptance criteria or has through wall leakage, the weld is removed and destructively examined to determine extent of cracking, ~~and/or~~ extent of selective leaching, and the microstructure phase distribution.

- Specify, when a weld is found that does not meet the acceptance criteria a structural integrity analysis shall be performed to confirm that the load carrying capacity of the installed welds remain adequate to support the intended function of the ECW system through the period of extended operation.

- Specify, discovery of a weld indication that does not meet the acceptance criteria requires expansion of the volumetric examination sample population. Each weld found with a weld indication ~~that does~~ not meeting the acceptance criteria requires five additional volumetric examinations to be performed until no additional weld indication ~~that does~~ not meeting the acceptance criteria is found.

- Specify, discovery of selective leaching or continuous microstructure phase distribution that does not meet the acceptance criteria requires expansion of the destructive examinations sample population. Each destructive examination ~~that does~~ not meeting the acceptance criteria requires five additional destructive examinations to be performed until no unacceptable selective leaching or non-continuous microstructure phase distribution are ~~is~~ found.

- Specify discovery of an unacceptable structural integrity evaluation requires performing the following:
  - A determination of operability.
  - An extent of condition evaluation to determine the cause of the structural integrity evaluation failure and identify other locations requiring examination. These additional examinations will focus on stress margin locations less than or equal to that of the structurally unacceptable weld.
  - Monthly walkdowns of aboveground aluminum bronze welds.
  - Monthly yard walkdowns to verify no through-wall leakage is occurring.
  - Volumetric examination of an additional 25 above ground welds within the next six months to look for cracking.
  - Five additional volumetric examinations for each weld found with a weld indication not meeting the acceptance criteria until no additional-weld indication not meeting the acceptance criteria is found.
  - Determine a repair or replacement program of the susceptible weld(s) based on the cause of the structural integrity evaluation failure, results of the additional volumetric examinations and the extent of condition.

- Specify, if acceptance criteria are not met a determination of operability and an assessment of the extent of condition is performed. Additionally, perform an AMP effectiveness evaluation to determine program changes required to manage the aging.

- Specify, corrective action for selective leaching found under degraded ECW buried piping coatings such as surface conditioning is performed until no selective leaching is

detected. If unacceptable wall thickness is found following surface conditioning, the buried ECW piping is repaired or replaced.

Conclusion

The continued implementation of the Selective Leaching of Aluminum Bronze program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.30 10 CFR Part 50, Appendix J

Program Description

The 10 CFR Part 50 Appendix J program manages cracking, loss of material, loss of leak tightness, loss of sealing, and leakage through containment to assure leakage through the primary containment, and systems and components penetrating the primary containment, does not exceed allowable leakage rate limits specified in the Technical Specifications. The 10 CFR Part 50 Appendix J program does not prevent degradation due to aging effects but provides measures for monitoring to detect the degradation prior to the loss of intended function. Periodic monitoring of leakage from the containment, containment isolation valves, and containment penetrations assures proper maintenance and repairs can be performed prior to the loss of intended function. The 10 CFR Part 50 Appendix J program establishes compliance with the regulations and guidance provided in 10 CFR Part 50 Appendix J, *Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors* (Option B); Regulatory Guide 1.163, *Performance-Based Containment Leak-Testing Program*; NEI 94-01, *Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50 Appendix J.*

NUREG-1801 Consistency

The 10 CFR Part 50 Appendix J program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.S4, 10 CFR Part 50 Appendix J.

Exceptions to NUREG-1801

Program Elements Affected:

Monitoring and Trending (Element 5)

~~None~~ The STP 10 CFR Part 50, Appendix J program is revised to use the guidance provided in NEI 94-01 Revision 2-A. NUREG-1801 Rev 2 removed the revision number from NEI 94-01 which allows the use of the guidance provided in NEI 94-01, Revision 2-A. Additionally, STP Amendment Nos 210 and 197 to the Unit 1 and 2 Facility Operating Licenses, respectively revises Technical Specification Section 6.8.3.j to state this program shall be in accordance with the guidelines contained in Nuclear Energy Institute (NEI) topical report NEI 94-01 Revision 2-A, dated October 2008.

Corrective Actions (Element 7)

~~None~~ The STP 10 CFR Part 50, Appendix J program is revised to use the guidance provided in NEI 94-01 Revision 2-A. NUREG-1801 Rev 2 removed the revision number from NEI 94-01 which allows the use of the guidance provided in NEI 94-01, Revision 2-A. Additionally, STP Amendment Nos 210 and 197 to the Unit 1 and 2 Facility Operating Licenses, respectively revises Technical Specification Section 6.8.3.j to state this program shall be in accordance with the guidelines contained in Nuclear Energy Institute (NEI) topical report NEI 94-01 Revision 2-A, dated October 2008.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Monitoring and Trending (Element 5)

Procedures will be enhanced to specify a surveillance frequency of 15 years following a successful Type A test.

Corrective Actions (Element 7)

Procedures will be enhanced to specify a surveillance frequency of 15 years following a successful Type A test.

Operating Experience

STP most recent Type A tests for each unit are as follows. STP maximum allowable leakage rate (La) at test pressure is 0.3 percent of containment air by weight per day (wt%).

Unit 1

Date of last Type A test: 10/5/09

As-Found Leakage: 0.1180 wt%

Approximate date of next Type A test: 2024

Unit 2

Date of last Type A test: 5/5/07

As-Found Leakage: 0.1423 wt%

Approximate date of next Type A test: 2022

Types B and C leakage are listed below in terms of standard cubic centimeters per minute (sccm). The min path from as found tests is represented by AF; the min path from as left conditions is represented by AL.

Unit 1

Max Path	Min Path AF	Min Path AL
94655.3	21380.6	21196.1

Unit 2

Max Path	Min Path AF	Min Path AL
98717.2	40120	32911

STP allowable B and C leakage (0.6 La) is 455,050 sccm. As a percentage of 0.6 La that makes the above values:

Unit 1

Max Path	Min Path AF	Min Path AL
20.8%	4.7%	4.7%

Unit 2

Max Path	Min Path AF	Min Path AL
21.7%	8.8%	7.2%

STP also has an administrative maintenance limit of 200,000 sccm. As a percent of this value, then:

Unit 1

Max Path	Min Path AF	Min Path AL
47.3%	10.7%	10.6%

Unit 2

Max Path	Min Path AF	Min Path AL
49.4%	20.1%	16.456%

The results of these tests show that the STP containment leakage rates are well below the allowable rates for all tests. Type A rates are less than half the maximum allowable leakage rate at test pressure. Type B and C leakage is less than one fourth of the maximum allowable and less than half of the administrative maintenance limit.

Conclusion

The continued implementation of the 10 CFR Part 50, Appendix J program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation

B2.1.33 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

Program Description

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program, which is implemented as part of the Structures Monitoring Program (SMP), manages cracking, loss of bond, loss of material (spalling, scaling), cracking due to expansion, increase in porosity and permeability, loss of strength, and loss of form by performing inspection and surveillance activities for the Essential Cooling Water (ECW) Intake, and Discharge ~~all~~ water control structures associated with emergency cooling water systems. STP is committed to conform to the intent of RG 1.127 with respect to the essential cooling pond (ultimate heat sink). The Structures Monitoring Program (B2.1.32) in compliance with 10 CFR 50.65, *The Maintenance Rule*, includes the ECW Intake and Discharge ~~all~~ water control structures which are within the scope of RG 1.127, as evaluated in NUREG-1801. The essential cooling pond, the Essential Cooling Water (ECW) ~~pond~~ Intake structure, and the ECW ~~essential cooling pond~~ Discharge structure are ~~the water control structures~~ the items within the scope of license renewal and ~~that~~ are monitored by this aging management program. Monitoring of structure settlement includes measurements of benchmark elevations on the ECW Intake and Discharge structures and elevations along the route of the buried portion of the ECW pipes. The essential cooling pond (ultimate heat sink) receives periodic monitoring of its hydraulic and structural condition, which includes inspection ~~evaluation~~ of erosion inhibiting structures, ~~conditions of benchmarks and piezometers, measuring the essential cooling pond volume as indicative of any~~ monitoring of sediment accumulation, and seepage rate evaluation. Inspections of the essential cooling pond and ECW Intake and Discharge structures are performed every five years. ~~except~~ Sediment monitoring using soundings, ~~which~~ is performed every ten years.

NUREG-1801 Consistency

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program, is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants.

Exceptions to NUREG-1801

Program Elements Affected:

Detection of Aging Effects (Element 4)

NUREG-1801 cites Regulatory Guide 1.127 for describing periodic inspections to be performed at least once every five years. STP has extended the frequency interval for sediment monitoring of the Essential Cooling Pond (ECP) to every 10 years. (Ref. Licensing Basis Document Change Request CN-3005) The makeup to the ECP is either through the well water system or from the Main Cooling Reservoir. Each source of makeup is relativity free of sediment. There are no external sources draining into the pond to promote sediment buildup, and it is isolated from the external sources by the outer embankment which completely surrounds the pond. Sediment level was measured by soundings performed every year from 1987 to 1997, with subsequent surveys performed in 2002 and 2009. There has been no measureable accumulation of sediment. Therefore, extending the frequency interval for sediment surveys from every 5 years to every 10 years will have no ~~affect~~ effect on the ECP

design to perform its intended function of supplying water for a minimum of 30 days of heat removal without outside makeup.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Preventive Actions (Element 2)

For ASTM A325, ASTM F1852, and/or ASTM A490 structural bolts, plant procedures will be revised to specify the preventive actions for storage, protection and lubricants recommended in Section 2 of Research Council for Structural Connections publication "*Specification for Structural Joints Using ASTM A325 or A490 Bolts.*"

Parameters of Monitored or Inspected (Element 3)

Procedures will be enhanced to require monitoring of essential cooling pond for sediment accumulation using soundings.

Procedures will be enhanced to require evaluation of essential cooling pond seepage rate.

Procedures will be enhanced to require visual inspection of the essential cooling pond including checking the embankment lining for signs of erosion, loss of form as in degradation of slope protection features.

Detection of Aging Effects (Element 4)

Procedures will be enhanced to specify inspections of the essential cooling pond and ECW Intake and Discharge structures at intervals not to exceed five years or to immediately follow significant natural phenomena ~~except sediment monitoring, which is performed every ten years~~.

Procedures will be enhanced to require an essential cooling pond seepage rate evaluation be performed every 5 years.

Procedures will be enhanced to require sediment monitoring be performed every ten years using soundings.

Procedures will be enhanced to specify ACI 349.3R-96 and ACI 201.1R-68 as the basis for defining quantitative acceptance criteria.

Operating Experience

A review of the structures monitoring inspection documents shows that the ~~water control structures at STP including the essential cooling pond,~~ ECW Intake and ECW Discharge structures have been subject to relatively few aging effects. These inspections include scheduled structures monitoring inspections. ~~and detailed visual inspections of the essential cooling pond.~~ All structures have always been in acceptable conditions and met engineering functional requirements including performance, maintainability, and safety.

Essential cooling pond inspection report from 1997 states measurements of pond volume over the years have indicated virtually no accumulation of sediments within the pond. The differential settlements of the ECW Intake structure and ECW Discharge structure were well within the allowable limit of ¾ in. The deflections measured along buried ECW pipe routes using benchmark elevations were found to be well within the allowable of 1.5 in. ~~All of t~~The ~~essential~~

~~cooling pond~~ structural benchmarks ~~and piezometers~~ were found to be fully functional and measurements were being taken as specified in the UFSAR. There was an array of shrinkage cracks running longitudinal along the soil-cement and concrete paved exterior slopes of embankments, however, this was attributed due to the fluctuating moisture contents of the soil within and as such did not exhibit any signs of erosion

Two minor potential consequences of growing vegetation around the essential cooling pond slopes have been identified. The potential for cracking of areas with soil-cement and concrete leading to soil erosion and the issue of clogging (owing to soil and vegetation) possibly leading to entrapping of debris near the trash racks of the ECWIS was identified. These conditions are non-aging related and could easily be fixed by regular herbicide application.

Conclusion

The continued implementation of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Enclosure 3

STPNOC Regulatory Commitments
Replacement of Commitments 26 and 44 line in/out

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
26	Enhance the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program procedures to: • Specify inspections of the essential cooling pond and ECW Intake and Discharge structures at intervals not to exceed five years or to immediately follow significant natural phenomena ~~except sediment monitoring, which is performed every ten years~~. • Specify essential cooling pond sediment monitoring be performed every ten years using soundings. • Specify the preventive actions for storage, protection and lubricants recommended in Section 2 of Research Council for Structural Connections publication "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for ASTM A325, ASTM F-1852 and /or ASTM 490 bolts. • Specify ACI 349.3R-96 and ACI 201.1R-68 as the basis for defining quantitative acceptance criteria. • Specify the essential cooling pond seepage rate evaluation be performed not less than once every 5 years. • Specify visual inspection of the essential cooling pond embankment lining for signs of erosion, loss of form as in degradation of slope protection features.	B2.1.33	Complete no later than six months prior to the period of extended operation. Inspections to be complete no later than six months prior to the PEO or the end of the last refueling outage prior to the PEO, whichever occurs later. CR 10-23601
44	The Selective Leaching of Aluminum Bronze program will: • Replace all aluminum bronze castings susceptible to selective leaching, including attachment welds related to the castings with material that is not susceptible to selective leaching. • Replace aluminum bronze root valve adapter socket welds with material that is not susceptible to selective leaching. • Replace extruded piping tees with aluminum bronze weld repairs where the repair size is such that failure of the repair would affect the structural integrity of the component.	B2.1.37	Replacements and inspections to be complete no later than six months prior to the PEO or the end of the last refueling outage prior to the PEO, whichever occurs later.

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	Enhance the Selective Leaching of Aluminum Bronze procedure to: • Specify loss of material due to selective leaching is monitored through system walkdowns and destructive examinations. • Specify cracking associated with selective leaching is monitored through volumetric examination and destructive examination. • Specify phase distribution to verify the potential for continuous selective leaching is monitored through destructive examination. • Verify the management of cracking of the above ground weld population with no backing rings by performing a one-time volumetric examination on 20 percent with a maximum of 25 welds prior to the period of extended operation. • Specify, if a weld indication that does not meet the acceptance criteria is found during the one-time inspection of welds with no backing rings, periodic volumetric examinations of 20 percent with a maximum of 25 welds will be performed every 10 years thereafter. • Verify, the management of cracking of the above ground weld population with backing rings by performing periodic volumetric examinations on 20 percent with a maximum of 25 welds prior to the period of extended operation and every 10 years thereafter. • Specify, the samples for volumetric examination be randomly selected from the total population of above ground welds, considering construction and size distributions. • Verify, the management of loss of material due to selective leaching ~~and~~ or microstructure phase distribution of the above ground weld population with and without backing rings by performing a one-time destructive examination on 20 percent with a maximum of 25 welds with backing rings and 20 percent with a		Procedure changes no later than the date the renewed operating licenses are issued. CR 12-22150

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	maximum of 25 welds without backing rings prior to the period of extended operation. • Specify, if loss of material due to selective leaching or microstructure phase distribution does not meet the acceptance criteria during the one-time destructive examinations, periodic destructive examinations of 20 percent with a maximum of 25 welds will be performed every 10 years thereafter. • Require the sample population for destructive examinations be randomly selected from the total population of welds with and without backing rings, construction and size distributions. • Require a weld which does not meet the acceptance criteria or has through wall leakage, be removed and destructively examined to determine extent of cracking, and/or extent of selective leaching and the microstructure phase distribution. • Require a weld which does not meet the acceptance criteria or has through wall leakage, be documented in the corrective action program, and a structural integrity analysis be performed to confirm that the load carrying capacity of the installed welds remain adequate to support the intended function of the ECW system through the period of extended operation. • Require an external surface examination capable of detecting selective leaching will be performed on the buried ECW piping welds in the vicinity of degraded coatings to detect loss of material due to selective leaching. • Require that the history of the volumetric and destructive examinations results be maintained and a review be performed to identify potential adverse trends or other indications requiring action. • Specify, the acceptance criterion for volumetric examination of aluminum bronze welds is no detected planar indication that is surface connected (exposed to the ECW environment) unless the depth of the indication is		

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	contained within the 80% of the weld root pass region. An indication not connected to the surface (not exposed to the ECW environment) is acceptable. • Specify, the acceptance criterion for visual inspection of the aluminum bronze welds and adjacent copper alloy piping during the walkdowns is no through wall leakage. • Specify, the acceptance criterion for destructive examinations is; o No loss of material due to selective leaching penetrating 80% of the root-pass region. o Found selective leaching is ~~and~~ non-propagating (surrounded by a non-continuous ~~resistant~~ phase distribution). o The microstructure of the weld root region shall exhibit~~s~~ a non-continuous phase distribution consistent with the metallurgical technical basis report. • Specify, discovery of a weld indication that does not meet the acceptance criteria requires expansion of the volumetric examination sample population. Each weld found with a weld indication ~~that does~~ not meeting the acceptance criteria requires five additional volumetric examinations to be performed until no additional weld indication ~~that does~~ not meeting the acceptance criteria is found. • Specify, discovery of selective leaching or continuous microstructure phase distribution that doe~~s~~ not meet the acceptance criteria requires expansion of the destructive examinations sample population. Each destructive examination that does not meet the acceptance criteria requires five additional destructive examination examinations to be performed until no unacceptable selective leaching or non-continuous microstructure phase distribution are ~~is~~ found. • Specify, discovery of an unacceptable structural integrity evaluation requires performing the following.		

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	○ A determination of operability. ○ An extent of condition evaluation to determine the cause of the structural integrity evaluation failure and identify other locations requiring examination. These additional examinations will focus on stress margin locations less than or equal to that of the structurally unacceptable weld. ○ Monthly walkdowns of aboveground aluminum bronze welds. ○ Monthly yard walkdowns to verify no through-wall leakage is occurring. ○ Volumetric examination of an additional 25 above ground welds within the next six months to look for cracking. ○ Five additional volumetric examinations for each weld found with a weld indication not meeting the acceptance criteria until no additional-weld indication not meeting the acceptance criteria is found and. ○ Determine a repair or replacement program of the susceptible welds within the STP Technical Specification requirements based on the cause of the structural integrity evaluation failure, results of the additional volumetric examinations and the extent of condition. • Specify, when acceptance criteria are not met a determination of operability and an assessment of the extent of condition is performed. Additionally, perform an AMP effectiveness evaluation to determine program changes required to manage the aging. • Specify, the acceptance criterion for extent of loss of material on the external surface of buried aluminum bronze piping with coating degradation is that upon removal of the selective leaching the minimum wall thickness is maintained. • Specify, corrective action for selective leaching found under depredated ECW buried piping coatings such as surface conditioning is performed until no selective leaching is detected. If unacceptable wall thickness following surface conditioning is found, the buried ECW piping is repaired or replaced.		