



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

May 4, 2016
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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,
License Renewal Application – Aluminum Bronze AMP (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. "Summary of Public Meeting with STP to Discuss the Plant-Specific Aging Management Program, Selective Leaching of Aluminum Bronze, Associated with the STP License Renewal Application", dated February 8, 2016. (ML16033A007)

By Reference 1, STP Nuclear Operating Company (STPNOC) submitted a License Renewal Application (LRA). A public meeting was held with the NRC on January 19, 2016, to discuss STPNOC's Aging Management Program (AMP) for selective leaching of Aluminum Bronze. As summarized in Reference 2, STPNOC is providing an update to the License Renewal Application (LRA) Appendices A and B, to describe STPNOC's AMP for Selective Leaching of the Aluminum Bronze. Enclosure 1 to this letter provides the replacement LRA sections.

Regulatory commitment items 39 and 44 in LRA Table A4-1 have been replaced as provided in Enclosure 2. There are no other commitments in this letter.

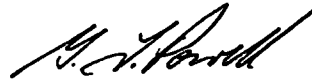
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If there are any questions regarding this submittal, please contact Arden Aldridge, STP License Renewal Project Lead, at (361) 972-8243 or Rafael Gonzales, STP License Renewal Project regulatory point-of-contact, at (361) 972-4779.

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

Executed on May 4, 2016
Date



G. T. Powell
Executive Vice President
and Chief Nuclear Officer

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Enclosures:

1. STPNOC LRA AMP Replacement
2. STPNOC Regulatory Commitments Replacement of Commitments 39 and 44

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Enclosure 1

STPNOC LRA AMP Replacement

List of Replaced LRA Sections

Affected LRA Section
A1.37
B2.1.37

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.

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 3 percent with a maximum of 10 welds of the above ground weld population with no backing rings are examined one-time volumetrically to validate weld integrity. If rejectable weld flaws (weld defects) per ASME Section IX requirements are 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 validate weld integrity prior to the period of extended operation and every 10 years thereafter. If no weld defects are found during the 20 percent inspection performed prior to the period of extended operation, the 10 year follow-up volumetric examinations will be reduced to 3 percent with a maximum of 10 welds.

Discovery of weld defects requires expansion of the volumetric examination sample population. Each weld found with a defect requires five additional volumetric examinations to be performed until no additional weld defects are found.

Additionally, the aging management program directs that two welds with backing rings are destructively examined prior to the period of extended operation to verify the absence of selective leaching.

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

Aluminum bronze welds found to have defects or through wall leakage are removed and destructively examined to determine the extent of cracks or selective leaching. 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.

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 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 3 percent with a maximum of 10 welds of the above ground weld population with no backing rings are examined one-time volumetrically to validate weld integrity. If rejectable weld flaws (weld defects) per ASME Section IX requirements are 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 validate weld integrity prior to the period of extended operation and every 10 years thereafter. If no weld defects are found during the 20 percent inspection performed prior to the period of extended operation, the 10 year follow-up volumetric examinations will be reduced to 3 percent with a maximum of 10 welds.

Discovery of weld defects requires expansion of the volumetric examination sample population. Each weld found with a defect requires five additional volumetric examinations to be performed until no additional weld defects are found.

Additionally, the aging management program directs that two welds with backing rings are destructively examined prior to the period of extended operation to verify the absence of selective leaching.

Yard walkdowns are performed in 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 acceptance criterion for volumetric examination of aluminum bronze welds is no defects. The acceptance criterion for visual inspection of the aluminum bronze welds and adjacent copper alloy piping during the walkdowns is no through wall leakage.

Aluminum bronze welds found to have defects or through wall leakage are removed and destructively examined to determine the extent of cracks or selective leaching. 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.

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 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 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, 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.

Prior to the period of extended operation, 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 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.

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.

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.

Operating experience has shown that ERCuAl-A2 welds without weld flaws, welds using ERCuNiAl weld material, and welds without backing rings are not susceptible to cracking caused by selective leaching.

The aging management program will verify the weld integrity of the above ground weld population with no backing rings by performing a one-time volumetric examination on 3 percent with a maximum of 10 welds prior to the period of extended operation. If rejectable weld flaws (weld defects) per ASME Section IX requirements are 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.

The aging management program will verify the weld integrity 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. If no weld defects are found during the inspection performed prior to the period of extended operation of weld with backing rings, the follow up volumetric examinations will be reduced to 3 percent with a maximum of 10 welds.

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 above ground welds.

Two welds with backing rings will be destructively examined prior to the period of extended operation to verify the absence of selective leaching.

Aluminum bronze welds found to have defects or through wall leakage are removed and destructively examined to determine extent of cracks or selective leaching. 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.

Detection of Aging Effects (Element 4)

The Selective Leaching of Aluminum Bronze program includes a one-time and periodic volumetric examination of above ground aluminum bronze welds to determine if selective leaching or cracking is occurring.

The Selective Leaching of Aluminum Bronze program includes visual inspections every six months (not to exceed nine 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.

Whenever aluminum bronze materials are exposed during inspection of the buried ECW piping, the components are examined for indications of 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.

Aluminum bronze welds found to have defects or through wall leakage are removed and destructively examined to determine extent of cracks or selective leaching.

Monitoring and Trending (Element 5)

This is an inspection program to determine if selective leaching is occurring and the degree of the selective leaching. No trending is performed.

Acceptance Criteria (Element 6)

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

If an acceptance criterion is not met, 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 tested material remains adequate to support the intended function of the ECW system through the period of extended operation.

Corrective Actions (Element 7)

Aluminum bronze welds found to have defects or through wall leakage are removed and destructively examined to determine the extent of cracks or selective leaching. 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.

Discovery of weld defects requires expansion of the volumetric examination sample population. Each weld found with a defect requires five additional volumetric examinations to be performed until no additional weld defects are found.

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.

When acceptance criteria are not met a determination of operability and an assessment of the extent of condition is performed.

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 dealloying 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 dealloying locally and the crack propagating through the dealloyed 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 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:

- Verify, the weld integrity of the above ground weld population with no backing rings by performing a one-time volumetric examination on 3 percent with a maximum of 10 welds prior to the period of extended operation.
- Specify, if weld flaws are 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 weld integrity 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, if no weld defects are found during the periodic inspection performed prior to the period of extended operation of weld with backing rings, the follow-up volumetric examinations will be reduced to 3 percent with a maximum of 10 welds.
- Specify, the samples for volumetric examination be randomly selected from the total population of above ground welds.
- Require, two welds with backing rings be destructively examined prior to the period of extended operation to verify the absence of selective leaching.
- Require, welds which are found to have defects or through wall leakage, be removed and destructively examined to determine the extent of cracks or selective leaching.

- Require, welds which are found to have defects or 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.

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 selective leaching or cracking is occurring.
- Require welds which are found to have defects or through wall leakage, be removed and destructively examined to determine extent of cracks or selective leaching.

Acceptance Criteria (Element 6)

Procedure will be enhanced to:

- Specify, the acceptance criterion for volumetric examination of aluminum bronze welds is no defects.
- 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.
- Require, the unacceptable inspections 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.

Corrective Actions (Element 7)

Procedure will be enhanced to:

- Require, upon discovery of weld defects or through wall leakage, the welds are removed and destructively examined to determine extent of cracking or selective leaching.
- Require, weld defects or 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.
- Specify, discovery of weld defects requires expansion of the volumetric examination sample population. Each weld found with a defect requires five additional volumetric examinations to be performed until no additional weld defects are found.

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.

Enclosure 2

**STPNOC Regulatory Commitments
Replacement of Commitments 39 and 44**

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
39	<p>Enhance the Selective Leaching of Aluminum Bronze procedures to:</p> <ul style="list-style-type: none"> Visually examine aluminum bronze materials exposed during inspection of the buried essential cooling water piping for evidence of leakage, and If a leak from buried aluminum bronze welds is discovered by surface water monitoring or during a buried ECW piping inspection, a section of each leaking weld will be removed for destructive metallurgical examination. 	B2.1.37	<p>No later than the date the renewed operating licenses are issued.</p> <p>CR 11-28986</p>
44	<p>The Selective Leaching of Aluminum Bronze program will:</p> <ul style="list-style-type: none"> 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. <p>Enhance the Selective Leaching of Aluminum Bronze procedure to:</p> <ul style="list-style-type: none"> Verify the weld integrity of the above ground weld population with no backing rings by performing a one-time volumetric examination on 3 percent with a maximum of 10 welds prior to the period of extended operation. 	B2.1.37	<p>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.</p> <p>Procedure changes no later than the date the renewed operating licenses are issued.</p> <p>CR 12-22150</p>

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	<ul style="list-style-type: none"> Specify, if weld defects are 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 weld integrity 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, if no weld defects are found during the periodic inspection performed prior to the period of extended operation of welds with backing rings, the follow-up volumetric examinations will be reduced to 3 percent with a maximum of 10 welds. Specify, the samples for volumetric examination be randomly selected from the total population of above ground welds. Require two welds with backing rings be destructively examined prior to the period of extended operation to verify the absence of selective leaching. Require welds which are found to have defects or through wall leakage, be removed and destructively examined to determine extent of cracking or selective leaching. Require welds which are found to have defects or 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. Specify, the acceptance criterion for volumetric examination of aluminum bronze welds is no defects. 		

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	<ul style="list-style-type: none">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, discovery of weld defects requires expansion of the volumetric examination sample population. Each weld found with a defect requires five additional volumetric examinations to be performed until no additional weld defects are found.		