

# SOUTH TEXAS PROJECT ALUMINUM BRONZE AGING MANAGEMENT REQUEST FOR ADDITIONAL INFORMATION

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December 21, 2016



## Purpose

Discuss enhancements to the Aluminum Bronze Aging Management Program and clarification information in response to the Request for Additional Information dated December 5, 2016.

Identify any areas where additional information would be beneficial.



## Requested Clarification Information

1. Approximate number of susceptible above and below ground welds.

Size	Above		Above		Below		Below		Total		Total	
	Grd Butt Welds w/BR	No BR	Grd Butt Welds w/BR	No BR	Grd Butt Welds w/BR	No BR	Grd Butt Welds w/BR	No BR	Grd Butt Welds w/BR	No BR	Grd Butt Welds w/BR	No BR
1		12										12
2		18										18
3	148	158					148	158				306
4	104	156					104	156				260
6	206	136	6	12			212	148				342
8	47	51					47	51				98
10	74	162	76	350			150	512				662
14	15	9					15	9				22
24	9	33					9	33				42
30	75	81	275	1224			350	1305				1655
<b>Total</b>	678	816	357	1586			1035	2402				3437
	1494		1943									



## Requested Clarification Information

1. Approximate number of susceptible above and below ground welds.
2. Time of Flight Diffraction Technique (TOFD)
  - a. Opposing probes producing three primary wave components
  - b. Demonstrated through Low Rigor level qualification in accordance with section V, article 14 of the 2004 edition of the ASME, BPVC. Additional demonstration by NDE UT Level III for the Authorized Nuclear Inservice Inspector.
  - c. Graphical representation of results with a resolution in depth accuracy between 0.2mm to 1.0mm.
  - d. Non Destructive Examination personnel are qualified in conducting and evaluating examination results in accordance with STP procedure which is applicable to the examination of ASME Code Class 1, 2, and 3 pressure retaining components which meet the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, 2004.



## Requested Clarification Information (cont)

3. Acceptance Criteria for TOFD examination results
  - A destructive examination not meeting acceptance criteria would provide evidence that the welds are susceptible to selective leaching through the root pass. Requiring periodic monitoring, corrective actions, and tracking and trending requirements to assure on-going selective leaching is managed.
  - TOFD Examination will be utilized to perform extent of condition determinations in the event destructive examinations do not meet acceptance criteria and in performing periodic monitoring.
  - Loss of material due to selective leaching resulting in not meeting ASME Section XI Code required margins imposed by ASME Section XI structural factors for normal/upset and emergency/faulted conditions.



## Requested Clarification Information (cont)

4. Failed Structural Integrity Analysis Results:
  - a. Quantity of Extent of Condition TOFD UT examinations
    - TOFD UT Examination on the remaining above ground weld population using a sample with a 95/95 confidence until no additional weld indication not meeting the acceptance criteria and within structural integrity is found.
    - If a second weld is found that does not meet structural integrity, 100 percent of the remaining above ground welds will be TOFD UT examined
  - b. Timing of Examination
    - The extent of condition following one condition not meeting structural integrity of TOFD UT examinations will be completed within the limiting condition for operation time limits of the ECW system.
    - If a second weld is found that does not meet structural integrity the remaining TOFD UT examinations will be performed within **6 months**.



## Requested Clarification Information (cont)

4. Failed Structural Integrity Analysis Results:
  - c. Periodic TOFD UT examinations will be performed every 5 years with a 95/95 confidence sample.
  - d. The sample will be randomly selected from the total population of above ground welds associated with the weld type (with or without backing ring) not meeting acceptance criteria, considering construction, size distributions, structural integrity margins, and consequence of failure.
  - e. Basis for the sampling inspection parameters
    - Sample is based on a confidence level of 95 percent with a margin of error of 5 percent.
    - Selection criteria considers risk and variability of construction, structural integrity margins, and consequence of failure
    - Periodic Examinations frequency and quantity to assure detection and correction prior to exceeding design limits.



## Requested Clarification Information (cont)

4. Failed Structural Integrity Analysis Results:
  - f. Actions if subsequent inspections do not meet Structural Integrity:
    - Enter Limiting condition of operation
    - Determine extent of condition by performing TOFD UT examinations on 100 percent of the remaining above ground welds.
    - Repair or replacement program of the susceptible weld(s)
    - Perform actions to return ECW operable.
    - Perform an evaluation of the below ground weld margins to identify locations requiring inspection.





## Requested Clarification Information (cont)

### 5. Destructive Examinations not meeting Acceptance Criteria:

A destructive examination not meeting acceptance criteria would provide evidence that the welds are susceptible to selective leaching through the root pass. Requiring periodic monitoring, corrective actions, and tracking and trending requirements to assure on-going selective leaching is managed.

- a. How many TOFD examinations (loss of material due to selective leaching)
  - Within 60 days perform **five** TOFD examinations for each weld not meeting acceptance criteria (destructive examination, or periodic TOFD examination) until no additional weld indication not meeting the acceptance criteria is found.
  - Every 5 years perform periodic TOFD monitoring of any welds previously found to not meet acceptance criteria. These welds shall be monitored until 3 consecutive examinations identify no additional propagation of the selective leaching. (Periodic examination and Tracking and Trending)
  - Perform periodic TOFD examinations of an additional 10% sample of the remaining above ground weld types every 5 years. (Periodic examination and Tracking and Trending)



## Requested Clarification Information (cont)

5. Destructive Examinations not meeting Acceptance Criteria:
  - b. The examinations to be completed within 60 days of identifying acceptance criteria not met.
  - c. Periodicity and quantity of periodic examinations
    - Change the one time Destructive Examination to periodic TOFD examinations to be performed every 5 years.
    - Perform periodic TOFD monitoring of any welds found to not meet acceptance criteria. These welds shall be monitored until 3 consecutive examinations identify no additional propagation of the selective leaching. (Periodic examination and Tracking and Trending)
    - Perform periodic TOFD examination of an additional 10% sample of the remaining above ground weld types. (Periodic examination and Tracking and Trending)



## Requested Clarification Information (cont)

5. Destructive Examinations not meeting Acceptance Criteria:
  - d. Sampling locations are from previously identified weld locations not meeting acceptance criteria plus an additional 10% sample will be randomly selected from the total population of above ground welds associated with the weld type (with or without backing ring) not meeting acceptance criteria, considering construction, size distributions, structural integrity margins, and consequence of failure.
  - e. Basis for sampling inspection parameters
    - The destructive examination is replaced by periodic TOFD UT examinations to track and trend potential degradation.
    - Selection criteria considers risk and variability of construction, structural integrity margins, and consequence of failure.
    - Periodic Examinations frequency and quantity to assure detection and correction prior to exceeding design limits.



## Requested Clarification Information (cont)

6. The results of the UT examinations will be incorporated into the existing acceptance criteria for destructive examinations and the associated corrective actions addressed in question 3, 4, and 5.
7. Evaluation demonstrating the structural integrity margins of buried piping as compared to aboveground piping.
  - Considering the worst case conditions, the above ground 30” ECW piping has stress levels approximately **twice** that of the below ground piping; the above ground 10” ECW piping has stress levels approximately **three times** that of the below ground piping. In terms of flaw tolerance, for the maximum bending stresses discussed above, a comparison of the limiting through-wall flaw lengths for meeting structural integrity (L) for the below and above ground piping is **1.96/1.83**.



## Requested Clarification Information (cont)

8. 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 resistant phase distribution).
  3. The microstructure of the weld root region shall exhibit a non-continuous phase distribution consistent with the metallurgical technical basis report.



Questions?

