Talking Points

STPNOC Supplemental Information

South Texas Project and NRC Public Meeting
July 21, 2016

NRC Issue:

1. Scope of Program:

   Program states that extruded tees with weld repairs will be replaced if it is determined that "the repair size is such that failure of the repair would affect structural integrity of the component." However, during the audit, the applicant stated that weld repair size was not known for all of the affected tees.

   The NRC staff stated it needs to understand how the structural determination will be made in the absence of detailed information about weld repair size was not known for all of the affected tees.

   The applicant stated that it had found old tests and results that can be used to do structural analyses. If an analysis cannot be performed, the extruded tees would be replaced. The applicant stated that it will provide a description of the types of information it used and how the size was extrapolated from this information when it forwards the revised AMP.

STP Clarification:

The weld repair sizes are characterized utilizing the following techniques.

1. The vendor Record of Nonconformance is evaluated.
2. Where insufficient information is available then past radiography film is utilized to determine the limiting size of the weld repair by measuring the size of the area of interest on the film.
3. Performing a surface examination to characterize the weld repairs through polishing and etching the surface to distinguish the repair regions.

Extrapolation during sizing of the weld repair is not performed. Below is an example of how characterization is applied.

The weld repair radiographs for Unit 2 underground Tees T7017 and T7008. The area of weld repair isn't marked or directly obtainable from the film, but the area of interest is clearly marked. Both repair welds used two films, marked 0 to 1 and 1 to 2. For T7017, the distance between 0 to 1 is 3 inches and the distance between 1 to 2 is 2 5/8 inches. So the total circumferential distance of the weld repair is less than 5 5/8 inches. Likewise, for T7008, the distance between 0 to 1 is 2 inches and the distance between 1 to 2 is 1 3/4 inches. So the total circumferential distance of the weld repair had to be less than 3 3/4 inches.

NRC Issue:

2. Preventive Actions:

   NUREG-1800 states that activities for prevention and mitigation programs should be described. These actions should mitigate or prevent aging degradation. In this light, the NRC staff stated that the AMP should document which portions of the buried essential cooling water system are coated and cite the coating as a preventive action.

The applicant stated that the external surfaces of all buried piping are coated with coal tar, which makes the exterior surface not susceptible to selective leaching. Further, the applicant stated that above ground piping is not coated. The applicant stated that it will update the AMP accordingly.

The statements on aluminum bronze castings and extruded piping tees need not be repeated in this program element.

STP Clarification:

Preventive Actions (Element 2) is updated to document which portions of the buried essential cooling water system are coated and deleted the repeated statement.

NRC Issue:

3. Parameters Monitored or Inspected:

The NRC staff expressed two concerns.

<u>What is being monitored or inspected</u> - The AMP should consistently cite the following the appropriate parameters to be monitored or inspected:

- Loss of material, which is sometimes referred to as selective leaching in the applicant's AMP, is an aging effect that is a result of dealloying. It will be monitored via system walkdowns and destructive examinations.
- Cracking is an aging effect that is associated with dealloying in certain weld configurations. It will be monitored via volumetric examination.
- Phase distribution is a key factor in the basis for the AMP and is an indirect measure of the potential for continuous dealloying. It will be monitored via destructive examination.

The applicant agreed that it will address these considerations in its update to the AMP.

<u>What operating experience demonstrates</u> – The AMP states that operating experience has shown that certain welds are "not susceptible to cracking caused by selective leaching." The NRC staff stated that operating experience is not that definitive. Rather, the operating experience only demonstrates that there are no through-wall indications.

The applicant understood the two concerns and will address them in the revised AMP and background basis.

STP Clarification:

Parameters Monitored or Inspected (Element 3) is updated to use loss of material, cracking and phase distribution and removed operating experience sentence.

NRC Issue:

4. Detection of Aging Effects:

   NUREG-1800 states that detection of aging effects should occur before there is a loss of the structure- and component-intended function(s).

   The NRC staff asked, when buried pipe are exposed, what is the method of inspection and is the inspection conducted on internal, external, or both surfaces?

   The applicant stated that the method of inspection would be visual inspection of the outside coating. If degradation is found near a weld, a volumetric examination would be used.

   The applicant understood the question and will address them in the revised AMP and background basis.

   Welds with No Backing Rings

   The NRC staff notes that the AMP indicates that the purpose of the volumetric inspection is to identify cracks. The staff questioned whether crack identification was appropriate. This AMP is specifically for aluminum-bronze selective leaching. Therefore, the parameter to be monitored should be cracks with indication of dealloying. The applicant agreed.

   The NRC staff questioned whether a sample size of 3% of the welds with a maximum of 10 welds was sufficient or consistent with the GALL Report recommendations. The staff pointed to AMP XI.M32, "One-Time Inspection," which recommends 20% with a maximum of 25 prior to period of extended operation (PEO). The applicant agreed to increase the sample size to 20% with a maximum of 25 prior to PEO.

   The NRC staff questioned how many rejectable weld flaws can be identified during the one-time inspection to transition to periodic monitoring? The applicant stated that if one rejectable weld flaw is found, the scope of the one-time inspection will be increased by five and if one more rejectable weld flaw is found, the AMP will transition to periodic monitoring.

   Welds with Backing Rings

   Similar to Weld with No Backing Rings, the NRC notes that the AMP indicates that the purpose of the volumetric inspection is to identify cracks. The staff questioned whether crack identification was appropriate. This AMP is specifically for aluminum-bronze selective leaching. Therefore, the parameter to be monitored should be cracks with indication of dealloying. The applicant agreed and will update the AMP.

   The NRC staff noted that the periodic inspection of these welds begin with a scope of 20% of the welds with a maximum of 25 welds and, "if no weld defects are found," the number of inspections will be reduced to 3% with a maximum of 10 welds. The staff questioned the criteria for reducing the number of welds inspected. The application stated that if one weld flaws is found, the number of welds inspected will not decrease. The staff requested that the basis for reducing the number of welds inspected be strengthened. The applicant agreed to provide a stronger basis for the reduction.

Destructive Examinations

The NRC staff first questioned whether the AMP actually dealt with two distinct populations - welds without backing rings and welds with backing rings because the applicant's proposed susceptibility is different for each group.

- Backing rings – results in a crevice that can result in a greater potential for weld cracks and selective leaching
- Without backing rings – there is less dilution and a longer cooling period in root pass which creates a more susceptible microstructure for selective leaching

The applicant confirmed that they have two distinct populations and will update the AMP.

Next, the NRC staff questioned the number of destructive examinations to be conducted and the population to be inspected. Two welds with backing rings only is not consistent with the GALL Report recommendation and does not address both populations. Regarding the number of welds, AMP XI.M32, for example, recommends 20% with a maximum of 25. The staff indicated that both populations should be inspected. The applicant agreed and will update the AMP.

The NRC staff then discussed the purpose of the destructive examinations:

- for welds without backing rings, destructive examinations demonstrate:
  - no loss of material due to dealloying (layer –like, plug-like),
  - a phase distribution that supports the basis document,
  - and no cracking accompanied with dealloying

- for welds with backing rings, destructive examinations demonstrate:
  - no loss of material due to dealloying,
  - a phase distribution that supports the basis document,
  - and the frequency of occurrence of cracking accompanied with dealloying

The applicant agreed that it will address these considerations in its update to the AMP.

Inspection Locations

The NRC staff noted that the AMP states that inspection locations will be randomly selected. The staff indicated that the inspections should be representative of range of weld sizes and consider factors such as heat input and weld orientation. The applicant agreed and will update the AMP.

Inspection Timing

The NRC staff asked for clarification on when one-time inspections occur prior to PEO and how often the periodic inspection will be. The staff recognized that the phase distribution in the weld metal is not time dependent. The applicant stated that the one-time inspection will be performed in the 10 years prior to PEO. The applicant further stated that the initial periodic inspections will be performed in the 10 years prior to PEO and then on a 10-year basis. The staff noted that some editorial changes may be required in the AMP for consistent wording.

STP needs to make the following statement in the AMP: Inspections consist of performing a visual inspection over coated welds. In addition add reference AMP XI.M41 to this section.

Ensure that it is clear that we will be performing inspections 30-40, 40-50, and 50-60 years before and into PEO, respectively.

STP Clarification:

Detection of Aging Effects:
- Method of inspection of buried ECW piping is visual inspection of the outside coating.
- If degradation is found near a weld, a volumetric examination would be used.

Weld with No Backing Rings
- Parameter to be monitored should be cracks with indication of selective leaching.
- Sample size is increased to 20% with a maximum of 25 prior to PEO.
- If acceptance criteria are not met on one weld, the scope of the one-time inspection will be increased by five and the AMP will transition to periodic monitoring.

Welds with Backing Rings
- Parameter to be monitored should be cracks with indication of selective leaching.
- If acceptance criteria is not met on one weld, the scope of the one-time inspection will be increased by five.
- Reduction to 3% or maximum of 10 welds for subsequent inspections was removed.

Destructive Examinations
- Welds with no backing rings and welds with backing rings are maintained as two separate weld categories.
- Both populations will be destructively examined at 20% or maximum of 25 welds per category.
- Purpose of destructive examinations is:
    - Identify loss of material due to selective leaching (layer –like, plug-like),
    - identify the phase distribution in supports of the basis document,
    - and identify selective leaching not accompanied with cracking
- The terms layer or plug-like were discussed as part of casting component selective leaching characteristics. In describing selective leaching associated with welds the focus is selective leaching associated with cracking. If selective leaching is identified absent from cracks the destructive examination will characterize the extent of selective leaching.

Inspection Locations

- Randomly selected based on a representative sample of pipe sizes.
- Other factors like heat input and weld orientation are controlled by the established weld procedures assuring consistency and is not called out as specific inspection location criteria.

Inspection Timing

STP is performing the initial periodic inspections within the last 10 years of initial license and every 10 years thereafter. This wording assures the inspections would be performed within the 30-40 year, 40-50 year, and 50-60 year periods. No additional clarification is proposed.

Detection of Aging Effects (Element 4) is updated to:

- Reference AMP B2.1.18, (NUREG 1801, XI.M41) to address the buried piping coating inspections. Increase the one-time volumetric examination sample populations for welds with backing rings to 20%, maximum of 25 welds prior to PEO.
- Require periodic volumetric examination every 10 years of 20%, maximum of 25 welds if one weld without backing ring is found not to meet the acceptance criteria.
- Delete the reduction to 3% or maximum of 10 welds for subsequent inspections for welds with backing rings.
- Increase destructive examination sample population to 20%, maximum of 25 welds per categories.
- Add size distribution when selecting the samples for volumetric examination

NRC Issue:

5. Monitoring and Trending:

The NRC staff recognizes that qualitative results will not be obtained by the planned volumetric and destructive inspections/examinations. However, without planned trending, inspection results would be “buried” in the corrective action program. The staff questioned why the results of the volumetric and destructive inspections would not be compiled (trended) and evaluated, and why the results of the walk downs would not be compiled (trended) and evaluated. The applicant agreed to include compilation of results and evaluation as trending into the AMP.

STP Clarification:

Monitoring and Trending (Element 5) is updated to add compilation and evaluation of results.

NRC Issue:

6. Acceptance Criteria:

   The NRC staff and the applicant discussed what the acceptance criteria should be for the inspections and examinations.

   Volumetric Examinations

   The NRC staff noted that the AMP states the acceptance criteria for welds is no defects. However, the staff was unsure of what "no defects" mean. The applicant agreed to provide specific, detailed criteria for determining what indicates a rejectable weld indication.

   Destructive Examinations

   The NRC staff noted that the AMP does not provide acceptance criteria for the destructive examinations. The applicant agreed to provide specific, detailed criteria for determining acceptance criteria, including cracking, loss of material, and phase distribution.

   Buried Pipe Coatings

   The NRC staff noted that the AMP does not provide acceptance criteria for buried pipe coatings. The applicant agreed to revise the AMP to cite the criteria used in its Buried Piping and Tanks Inspection program during direct visual inspections of buried pipe coatings.

   Include a statement that points to the use of AMP XI.M41 for the acceptance criteria for buried piping.

   Acceptance Criteria

   - There is no acceptance criteria for the destructive examinations.
   - Why is there no acceptance criteria for the detection of plug-like or uniform dealloying?
   - Why is there no acceptance criteria for buried pipe coatings?

   STP Clarification:

   Volumetric Examinations
   - Replaced the term defect with "a weld indication that does not meet the acceptance criteria". Added specific weld indication acceptance criteria.

   Destructive Examinations
   - Added specific destructive examination acceptance criteria, added loss of material, cracking and added phase distribution to parameters monitored.

   Buried Pipe Coatings
   - Acceptance criteria for buried pipe coatings is referenced in AMP B2.1.18.

   Acceptance Criteria
   - Added acceptance criteria for the destructive examinations.
   - The acceptance criteria is revised to add measurable criteria for loss of material due to

selective leaching regardless of the type i.e. plug-like or uniform selective leaching. Selective leaching is characterized through destructive examination and the structural integrity evaluation is performed based on the size and amount of selective leaching regardless of the type. The acceptance criteria applied assures selective leaching is contained and non–propagating.

- Acceptance criteria for buried pipe coatings is referenced in AMP B2.1.18.

Acceptance Criteria (Element 6) is updated to:

- Reference AMP B2.1.18, (NUREG 1801, XI.M41) to address the buried piping coating inspection acceptance criteria.
- Replaced the term defect with “a weld indication that does not meet the acceptance criteria”.
- Added measureable acceptance criteria for the volumetric and destructive examinations.
- Added acceptance criteria for the destructive examinations.

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 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.

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.

NRC Issue:

7. Corrective Actions:

<u>Expansion of Examinations</u>

The NRC staff acknowledges that STP does not expect leaks associated with aluminum-bronze selective leaching once the casting components have been replaced. However, corrective action is a key element of an AMP. Therefore, the AMP should describe:

- What type of inspections will be conducted if aboveground leaks are detected?
- What type of inspections will be conducted if buried pipe welds leak?
- What type of expanded inspection will be conducted if leaks are detected (e.g. volumetric, destructive).

- For welds without backing rings, what corrective actions will occur if dealloying is detected?
- For welds with backing rings, what corrective actions will occur depending on the frequency of occurrence of cracking accompanied with dealloying?
- Will expansion of destructive examinations be conducted if acceptance criteria for destructive examinations is not met?
- What corrective actions will be taken for the detection of plug-like or uniform dealloying?
- What corrective actions will be taken for buried pipe coating defects?

Provide a description of the additional corrective actions that must be taken if STP finds unanticipated dealloying, i.e. additional destructive examinations.

STP should provide a reference to XI.M41 for corrective actions related to buried piping

The applicant agreed to expand the corrective action element of the AMP.

STP Clarification:

- Type of inspections to be conducted if above ground leaks are detected.
  - Additional volumetric inspections
  - Structural Integrity Evaluation
  - Repair replacement of leaking component
  - Evaluation of extent of condition and cause
  - AMP effectiveness evaluation

- Type of inspections to be conducted if buried pipe welds leak.
  - Additional volumetric inspections
  - Structural Integrity Evaluation
  - Repair replacement of leaking component
  - Evaluation of extent of condition and cause
  - AMP effectiveness evaluation

- Expanded inspection to be conducted if a leak is detected (e.g. volumetric, destructive).
  - 5 additional volumetric inspections
  - Destructive examination of leaking weld

- For welds with or without backing rings, corrective actions if unacceptable selective leaching is detected.
  - Structural integrity evaluation assessing acceptability through PEO
  - Scope expansion of 5 additional destructive examinations

- For welds with or without backing rings, corrective actions if unacceptable cracking accompanied with selective leaching.
  - Structural integrity evaluation assessing acceptability through PEO
  - Scope expansion of 5 additional welds volumetrically and destructively examined

- There is no specific acceptance criteria for the detection of plug-like or uniform selective leaching as it relates to welds. This is due to the characterization of the selective leaching performed as part of the destructive examination.

- Corrective actions for buried pipe coating defects is described in B2.1.18. Add reference to B2.1.18 for corrective actions when buried piping coating degradation is identified..
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- Additional corrective actions that must be taken if STP finds unanticipated selective leaching.
  - Additional destructive examinations
  - Structural Integrity Evaluation
  - Repair replacement of leaking component
  - Evaluation of extent of condition and cause
  - AMP effectiveness evaluation

Corrective Actions (Element 7) is updated to

- Add reference to B2.1.18 for corrective actions when buried piping coating degradation is identified.
- Revised corrective actions Element 7 to describe specific corrective actions when the acceptance criteria are not met.

NRC Issue:

8. Basis Document

The staff discussed a few questions on the Basis document. The staff noted that the margin between the detectable limit and the allowed flaw size for one set of buried pipe fittings was very low (i.e., 1.01). The applicant agreed to provide a stronger basis for the acceptability of these fittings.

Enclosure 1, page 54, Table 12
- Why is the 30-inch, discharge side tee (with a margin of 1.01 of allowable length to leak length) acceptable for service in the PEO?

STP Clarification:

The original analysis was reviewed in support of this leak rate assessment to identify the conservatisms in the Bechtel design analysis and where margins on stress can be reduced. It was concluded that two areas of conservatisms exist; the assumed value for the coefficient of subgrade reaction and the peak ground acceleration. The cumulative impact of using more realistic values for these input parameters reduced the faulted bending stress by about 51.3%. Therefore a multiplying factor of 0.513 was applied to the original code Equation 9D (faulted) bending stresses.

The resultant sensitivity change in the ratio of the allowable length L_{allow}/leak length L_{Leak} lowest margin below ground lowest margin Tee is:

10 gpm original:	30” discharge Tee @ 1.33
20 gpm original:	30” discharge Tee @ 1.01
10 gpm optimized:	30” discharge Tee @ 1.54
20 gpm optimized:	30” discharge Tee @ 1.22

NRC Issue:

At the audit on June 22, 2016, the applicant mentioned that its buried piping is coated with coal tar, which makes the exterior surface not susceptible to selective leaching. The coating would also impede detection of leaks originating from the inside of the pipe. The openings of the cracks of concern are only around 0.01 inches. Could this kind of crack/leak beach the coating? Even if it did, it might restrict the leak exit area to a degree, thus the leak rate calculations could be non-conservative.

STP Clarification:

Essential water buried piping is coated with Cold Tar Epoxy coating, and the weld joints are protected utilizing a Tape-Coat CT tape wrap. Discussions with the coatings development engineer at Chase Corporation concluded that Tape-coat CT, will not be able to resist the operating pressure if there is a leak. Water from a small leak could get trapped under the coating, but since this is only coated on the weld joints it would quickly work its way out to the edge of the coating. In his opinion if there was any delay it would be much less than a day, maybe a couple hours at most. Key considerations in this conclusion include:

- The coating is not designed to be a pressure boundary.
- Elongation of the backing and adhesive is 800% providing a very pliable coating that would present an ever increasing area to the initial through wall crack pressure allowing for rapid propagation of the outside diameter leakage to the tape joint and soil.
- Adhesive thickness is greater than 3 times the backing thickness and only has 10 lb/in adhesion strength. This low adhesive strength provides for tape alignment and maintenance of placement during soil movement only.
- Crack lengths of greater than 7 inches will provide sufficient pressure, area, and flow that resistance to flow rate from a through wall leak is considered to be negligible.