On June 4, 2013, at 11:00 a.m. EDT, the U.S. Nuclear Regulatory Commission (NRC) held a Conference Call Meeting with members of the Palisades management team at both parties’ request. The purpose of the call was to discuss the current repair and inspection plan related to the SIRWT. Palisades was shut down on May 5, 2013, in response to leakage from the SIRWT of 90 gallons per day which exceeded a leak rate limit of 38 gallons per day established in the NRC confirmatory action letter (CAL EA 12-155; ADAMS No. ML12199A409). Specific discussion topics included:

1. SIRWT floor replacement activities;
2. Nozzle design and Code compliance;
3. Resolution of questions from previous conference meetings; and
4. SIRWT return to service plan.

Status of Repair Activities

The licensee stated that they had all the plates installed in the SIRWT. They said that many plates were tack welded; however, they were in the process of welding the plate to plate welds. The licensee stated that there was approximately 600 linear feet of required welds and they had completed work on approximately 200 feet. The remaining work included the nozzle welds, reinforcing collars, re-installation of the overflow line and sparger line and closure of roof opening. The floor welds were scheduled to be completed on Friday, at which time they planned to move on to the work related to the nozzle welds, sparger line, complete non-destructive examinations (NDE) and eventually fill the tank during the following week. The licensee mentioned that Chicago Bridge and Iron (CBI) will be performing vacuum box testing in parallel with the welding work. The licensee will also perform visual examinations of the completed welds.
Nozzle Design and Code Compliance

The NRC asked if the licensee was following Section XI of Code (IWA 4000) for repair and replacement activities in order to meet the construction code (ANSI Standard B96.1). The NRC mentioned that B96.1 discusses information related to nozzle design at locations where the nozzles penetrate the sides of the tank. B96.1 also discusses information related to the nozzle design at the bottom of the tank and limits those nozzles in size and placement in keeping them relatively close to the side walls of the tank. The NRC asked if the currently ongoing replacement activities were restoring the tank to the original B96.1 code given that the nozzles are in the middle of the tank. The NRC also asked, given that the nozzles are in the center of the bottom of the tank and appear superficially not to be in accordance with B96.1, if analyses had been done to include the acceptability of nozzle to bottom plate interaction which will include the potential for loads on tank floor, compression of asphalt fiber board, movement of the nozzle and piping in the catacombs and oil canning of the tank floor. The NRC also asked the licensee if the nozzle design was consistent with API standards. The licensee stated that their work was restoring the tank to B96.1 requirements. The licensee stated that figure 18 of B96.1 appeared to establish the above requirements to ensure that the nozzles do not encroach on the shell, depending on the size/location of the elbow being installed. The licensee stated that the SIRWT was unique; however, the nozzles were far away from the shell. They said that the concern typically for flat bottomed tanks was the interaction of the bottom plate with the shell and the resulting stresses. It is the licensee’s view that the code established certain dimensions for the draw-off elbows to ensure that the nozzles are not encroaching on the shell. The NRC stated that the dimensions appeared to mention in figure 17 of B96.1 included the maximum dimensions and not the minimum.

The NRC also stated that figure 17 includes a 3-inch stiffener that welded to the tank floor and to the piping and is located directly below the shell plate. This stiffener is important in ensuring the nozzle to floor joint does not move relative to the rest of the floor and the piping system. The NRC also mentioned that the further the plate is from the shell, the less stiff the bottom plate, and hence, may not be able to provide the necessary support. The NRC stated that the issue the tank experienced in the past appears to be related to the independent motion of the tank floor relative to the nozzle. Since the licensee has freed up all the nozzles by boring them out of the concrete, one additional degree of movement that the tank didn’t have before, i.e., the vertical axis, will be introduced. Therefore, the vertical and horizontal movement of the nozzle has to be considered. The stiffener plate welded underneath the tank shell as displayed in figure 17 appears to exist to resolve this issue of relative motion. The NRC recommended the licensee to review this specific issue. The licensee stated that the original design had the nozzle locations in the same locations as today. The nozzles that penetrated the bottom plate did not have any reinforcement between the nozzle and the bottom plate. For the current design effort, the licensee stated that they will improve the design by allowing the nozzle and the plate to rise together and the installation of the seismic reinforcement collars on the nozzles will resolve the lateral movement in the X and Y planes. The licensee stated that any motion related to the nozzles will be purely vertical. The licensee said that their engineering change (EC) performs finite element analysis of the pipe-to-plate interface and also reviews the loading imparted to the plate from piping stresses. They said that all these factors have been accounted in their stress analyses and that the stresses are below the allowable values in the code.
The NRC asked if the licensee had considered the potential for fatigue in their analyses. The licensee stated that the large plate over which the nozzles reside will rest flat on the fiber board underlayment which in turn will rest on the concrete and this region will not experience any fatigue due to tank bottom flexure. The NRC asked if this area has the potential to experience any flexure due to other factors such as temperature, amount of water in the tank, etc., despite the existence of the reinforcing plate. The licensee stated that their analyses show that there will be no uplifting forces at the nozzle location and the joints have been designed to resist downward forces.

The NRC asked, if, for the old design, the licensee ran the same analysis, if they would come up with the same potential problem at those nozzles. The licensee stated that they would be speculating since they had not considered this issue. The NRC explained that if the licensee was able to prove that this analysis will cause a problem with the old design and they were able to demonstrate that the new design resolved the problem, this could show that the new design is adequate. The licensee stated that the root cause of the current leakage was a bad weld with only 20% fusion. The NRC said that even though the most recent leakage was the result of a bad weld, there were weld failures in the past, including small through wall leaks found during this inspection in 2013, that occurred on good welds where sand was not a factor and flexing, or fatigue failure, could be an issue. The licensee said that they will review this question from the NRC and provide follow up information.

The NRC said that if the licensee finds that they are not in accordance with B96.1, but have sufficient analysis to demonstrate that their design is satisfactory, it could satisfy design requirements. The NRC asked the licensee if they will consider a relief request if this were the case. The licensee said that they will not request a relief because Section 1.5 of B96.1 allows variations in design and details and that the bottom nozzles have been analyzed to ensure that they do not detract from the inherent strength of the tank. The licensee stated that Section 1.5 allows the constructor and the designer to depart from the code as long as they are within the strength requirements of the tank and stresses were acceptable. The licensee acknowledged that the nozzles in the middle of the tank are not clearly represented by any figure within the code; however, they are meeting the requirements of the code in Section 1.5 ensuring the analysis backs up the design.

The licensee added that B96.1 is not explicitly addressed in 10 Code of Federal Regulations (CFR) 50.55(a). Therefore, they reviewed their construction code from Section XI. IWA 4411 states that welding-brazing installations shall be performed in accordance with owner’s requirements and in accordance with the construction codes. The licensee stated that they have to review the owner’s requirements and the original design requirements of the tank while performing the repair and replacement activities. The original design requirements of the tank show the nozzles to be located in those specific positions. Therefore, the tank was licensed originally as designed; and, they will comply with construction code and original design requirements. The licensee said that they had analyzed the nozzles through both finite element and tank stress methods to ensure the structure is adequate. The NRC asked the licensee if the piping was temporarily supported while they were working on the nozzles. The licensee answered, yes.
Resolution of Questions from Previous Conference Meetings

1. Grout pad
   The licensee stated that the grout pad underneath the plate where the nozzles penetrate is no longer applicable since they will not be installing the grout pad.

2. Nozzle design issues
   Please see above for discussion on nozzle design

3. Difference in Aluminum alloys
   The licensee stated that their EC process is addressing the difference in materials and the new material is compatible.

4. EC package review by the NRC
   The NRC has been given access to the at risk portion of the EC packages today. The licensee stated that they will have an engineering quality review team meeting this afternoon and they will deliver the topic notes package.

5. N-705 Code Case
   The as found cracks will stay within the limits of the code case per the licensee’s evaluation. The licensee said a copy of this evaluation will be provided to the NRC once the vendor acceptance is complete.

6. Confirmatory Action Letter
   The licensee stated that they will continue to take the CAL offline with the branch chief and they will discuss this matter with the NRC within the next day.

The NRC asked the licensee if they had a final cause analysis for the current leakage based on the preliminary lab work and if they determined why they had a bad weld. The licensee stated that in order to eliminate this particular problem going forward, all the welds will be metal inert gas (MIG) welds as opposed to tungsten inert gas (TIG) welds. Also, they said that they had done significant work with the speed of welding and the angle of the weld and improved worker qualifications to ensure a higher quality weld. The NRC asked if the licensee understood why they had a fairly extensive area which had a lack of fusion with the recent weld. The licensee said that they found that the weld was initially a TIG weld and if you had the rod at a bad angle or changed the speed of the weld, it will impact the quality of the weld. The NRC asked if the licensee tried to replicate this problem to confirm the issue. The licensee said, yes, that they worked with PCI to replicate this issue by holding the rod at the wrong angle to affect the amount of weld fusion.
The NRC noted the presence of weld porosity which was indicative of moisture. The NRC asked if the licensee considered other factors such as moisture that could cause porosity besides the speed and the angle of the rod. The licensee stated that they had considered moisture as a factor, and ensured that all the welds they are performing are clean and free of moisture and contaminants. The NRC said that there is still a potential for moisture under the tank given certain events such as intrusion of rain water. The NRC said that the root cause evaluation did not include all the factors that could have caused a lack of fusion. The licensee agreed that the root cause report did not address those factors; however, it would be speculation if they did. The NRC said that the presence of oxides in the weld or outside the weld at the point where there was a lack of fusion may give the licensee some indication whether moisture or escaping gases from under the tank affected the weld. The NRC said that the existence or the lack of oxides is not a speculative issue and could be examined.

The NRC asked if the poor weld had passed the NDE. The licensee said that the welds installed last year passed all the standard NDE required by code. The NDE included visual examinations, dye-penetrant examinations and vacuum box testing. Ultrasonic testing (UT) or radiography are not required by the code, and could not be performed at these locations because the areas of the tank bottom cannot be accessed for examination. The NRC understood the licensee was training the welders and changed the welding process, but asked if the licensee set up mock up configurations for welding the intended locations under the plates and performing destructive testing to ensure they had good results. The licensee said that they did and noticed good results. The NRC asked the licensee what methods were employed to identify sub surface flaws since they could not use conventional methods to identify flaws such as lack of fusion and were not planning to employ Testex. The licensee stated that they were still in progress with Testex, and had completed two rounds of sample examination to improve their process and had created a third set of samples and were now in process of using the third sample to refine the Testex process for identifying sub surface defects. The licensee was in the process of waiting for the results of the third set of samples, and was using a graded approach to examining the fillet welds with the Testex method. The licensee said that Testex had a history of assessing fillet welds, primarily in the petroleum industry where they tested new tanks made of carbon or stainless steel. However, this will be their first examination of an aluminum tank and hence, were trying to refine their technique for this application.

The licensee stated that if the tank was originally constructed per design, they would not have had the failure experienced by the tank. The NRC asked what specifically was missed from the construction resulting in the failure. The licensee stated that sand, support for the plates as they flexed and welding technique were some of the factors involved.

The NRC asked why the as-built design drawings that showed the grout ring and sand differed from the real design of the tank. The licensee said they do not understand why the drawing was not updated in 1968 to reflect the as built condition of the tank at that time. The licensee stated that their speculation was that the plate that housed all the nozzles had a lack of bearing between the tank material and underlying concrete. The deficient weld conditions identified at various locations in the tank contributed to the leaks. The NRC said that the reinforcing plate was also mounted at an angle to the floor plate causing a hinge since there was a lack of parallelism.
The NRC asked why the floor plate that contained pitting in a number of regions was not being replaced and what the licensee intended to do to prevent pitting in the future. The licensee stated that there has been localized pitting of plate material and they were performing an analysis to determine the acceptable plate thickness for structural purposes. They were confident that the remaining thickness of the material that was thinned will satisfy structural requirements. In these locations, the new plate will be resolving the issue since it will be installed over the pitted areas. The licensee stated that the EC will address the code compliance related to this issue. Based on the licensee’s calculation, none of the observed indications were below minimum wall thickness. The NRC said that the pitting is probably the result of aluminum and moisture reacting with concrete (high pH). The NRC asked if there was a concern for corrosion in the area of the floor to shell joint. The licensee stated that the corner joint between the remnant plate within 6 inches of the wall and the area of the lapped plate was examined 12 inches out, was ground out completely, and a 100% UT was completed out to the edge of the shell. There were no signs of degradation in the plate to floor nozzles in these locations.

The NRC asked if the licensee had determined the cause of the control room leakage from the previous night. The licensee stated that both operations and engineering departments were reviewing this issue and there was no resolution at this point. The licensee had cut grooves in the concrete to direct rain water to a specific location. The NRC asked the licensee if they had discovered the source of the leakage. The licensee stated that even though the tank was empty, at least one nozzle was full of water and had a cap installed over them. The licensee was trying to determine if there was back leakage through a valve resulting in nozzle overflow. The licensee stated that they were still investigating the issue. The NRC asked the licensee if they were planning to resolve this issue prior to start up as it appeared there was a potentially new leak path into the control room. The NRC stated that the control room leakage is related to the CAL which required repairs to the concrete ceiling. The licensee stated that this commitment from the CAL was not closed out. The NRC stated that the current leakage could potentially impact the welding as a result of any moisture from the lap joint. The licensee stated that they were sensitive to this issue.

The NRC stated that when they examined the periphery of the tank, it noticed approximately ¼ inch gap under the shell and the plate. The NRC asked if this could be a potential access for water. The licensee stated that the roof design was such that they will be no path from the roof to the bottom of the tank. The licensee stated that even though this section is currently exposed, they will be restoring it to its original configuration.

The NRC asked if the licensee was addressing the issue of restoring the tank without the grout ring since the grout ring was required by original construction design. The licensee stated that this issue will be addressed through a condition report rather than an EC and that the tank can be erected on a concrete slab. The NRC asked if the design specification required the installation of a grout ring. The licensee stated that they will confirm the design specification does not include the grout ring.
The call lasted about an hour. Enclosure 1 is a list of attendees for the meeting.

Sincerely,

/RA/

John B. Giessner, Chief
Branch 4
Division of Reactor Projects

Docket Nos. 50-255 and 72-007
License No. DPR-20

Enclosure:
1. List of Meeting Attendees for the June 4, 2013, Conference Meeting

cc w/encl: Distribution via List Serv™
LIST OF MEETING ATTENDEES FOR THE JUNE 4, 2013
CONFERENCE MEETING

NRC Attendees

John Giessner, Chief, Division of Reactor Projects, Branch 4
David Hills, Chief, Division of Reactor Safety, Engineering Branch 1
Vijay Meghani, Reactor Inspector, Division of Reactor Safety, Engineering Branch 1
Thomas Taylor, Palisades Senior Resident Inspector
April Scarbeary, Palisades Resident Inspector
Swetha Shah, Reactor Engineer, Division of Reactor Projects, Branch 4
Dave Alley, Senior Materials Engineer, Nuclear Reactor Regulation
Mahesh Chawla, Project Manager, Division of Operating Reactor Licensing
Jeanne Dion, Technical Assistant, Division of Engineering, Research
Alexander Tsirigotis, Mechanical Engineer, Mechanical & Civil Engineering Branch
Donald Jones, Reactor Engineer, Division of Reactor Safety, Branch 1
Mel Holmberg, Senior Reactor Inspector, Division of Reactor Safety, Branch 1
Jay Lennartz, Project Manager, Division of Reactor Projects, Branch 4

Licensee Attendees

Charlie Arnone, Nuclear Safety Assurance Director
Barry Davis, Engineering Director
Dave Mannai, Entergy Licensing Director
Otto Gustafson, Licensing Manager
Jim Miksa, Licensing Engineer
Jeff Erickson, Palisades Engineering Licensing
Jody Haumersen, Palisades Manager of Engineering Systems
Tom Fouty, Palisades System Engineering Supervisor
David MacMaster, Palisades Design Engineering Supervisor
Jim Forehand, Palisades Engineering Programs Manager
Ron Williams, Entergy Engineering ISI Program
Andrew Barnett, Corporate Licensing
Joe Weicks, Entergy Engineering R&R Program
Dennis Demoss, Sargent & Lundy, Senior Vice-President
Charles Spalding, Sargent & Lundy Project Associate
H. Larry Anderson, Sargent & Lundy Project Associate
Rob Dahlgren, Sargent & Lundy Senior Project Manager
Karl Anderson, Sargent & Lundy Materials & Welding
Paul Bruck, Lucius Pitkin Inc.
The call lasted about an hour. Enclosure 1 is a list of attendees for the meeting.

Sincerely,

/RA/

John B. Giessner, Chief
Branch 4
Division of Reactor Projects

Docket Nos. 50-255 and 72-007
License No. DPR-20

Enclosure:
1. List of Meeting Attendees for the June 4, 2013, Conference Meeting

cc w/encl: Distribution via List Serv™
SUBJECT: SUMMARY OF THE JUNE 4, 2013, MEETING REGARDING PALISADES NUCLEAR PLANT SAFETY INJECTION REFUELING WATER TANK (SIRWT) LEAK

DISTRIBUTION: Doug Huyck
RidsNrrPMPalisades Resource
RidsNrrDorLPli3-1 Resource
RidsNrrDirIrib Resource
Chuck Casto
Cynthia Pederson
Steven Orth
Allan Barker
Carole Ariano
Linda Linn
DRPIII
DRSIII
Patricia Buckley
Tammy Tomczak
ROPassessment.Resource@nrc.gov