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1CAN080904

August 27, 2009

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: 35th Year Reactor Building Inspection Report
Arkansas Nuclear One, Unit 1
Docket No. 50-313
License No. DPR-51

Dear Sir or Madam:

Entergy Operations, Inc. (Entergy) conducted the Arkansas Nuclear One, Unit 1 (ANO-1) 35-Year Tendon Surveillance and Concrete Inspection from October 2008 through May 2009. Pursuant to the requirements of IWL-3300 of ASME Section XI, 2001 Edition with 2002 and 2003 Addenda, as modified by 10 CFR 50.55a and the ANO-1 Technical Specification (TS) 5.6.6, an engineering report was prepared to document the evaluation of the examinations that did not meet the acceptance standards of the ANO-1 Containment Inspection Program. In accordance with ANO-1 TS 5.6.6, the results of this engineering evaluation are to be submitted to the NRC within 30 days of the completion of the evaluation. The engineering evaluation was completed on July 29, 2009. A summary of the results is provided in the attachment to this letter.

Based on the results of the engineering evaluation of the 35-Year Tendon Surveillance and Concrete Inspection, Entergy has concluded that the ANO-1 Reactor Building is capable of performing its design function and will remain capable of performing its design function until completion of the 40-Year Tendon Surveillance and Concrete Inspection. Additionally, the observed indications do not indicate the presence of degradation in inaccessible areas.

This report includes no new commitments.

If you have any questions or require additional information, please contact me.

Sincerely,

DBB/rwc

Attachment: Results of Engineering Evaluation for the ANO-1 35-Year Reactor Building Tendon Surveillance and Concrete Inspection

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Attachment to

1CAN080904

Results of Engineering Evaluation for the ANO-1 35-Year Reactor Building Tendon Surveillance and Concrete Inspection

Results of Engineering Evaluation for the ANO-1 35-Year Reactor Building Tendon Surveillance and Concrete Inspection

Entergy Operations, Inc. (Entergy) conducted the Arkansas Nuclear One, Unit 1 (ANO-1) 35-Year Tendon Surveillance and Concrete Inspection from October 2008 through May 2009. While no indications were found that challenge current structural integrity or leak tightness of the Reactor Building (containment), several indications were found that did not meet the acceptance criteria of the ANO-1 Containment Inspection Program.

Pursuant to the requirements of IWL-3300 of ASME Section XI, 2001 Edition with 2002 and 2003 Addenda, as modified by 10 CFR 50.55a and the ANO-1 Technical Specification (TS) 5.6.6, an engineering report was prepared to document the evaluation of the examinations that did not meet the acceptance standards of the ANO-1 Containment Inspection Program. The engineering report was completed on July 29, 2009. In accordance with ANO-1 TS 5.6.6, the results of this evaluation are to be submitted to the NRC within 30 days of the completion of the evaluation. The results of the evaluation are presented below.

1. Protruding Buttonheads on Tendon 31H28

IWL-3221.3 states that the condition of tendon anchorage areas is acceptable if

(c) broken or unseated wires, broken strands, and detached buttonheads were documented and accepted during a preservice examination or during a previous inservice examination.

The two unseated or “protruding” buttonheads identified on tendon 31H28 have not been previously documented and therefore are evaluated as required by IWL-3300.

Protruding buttonheads can be a sign that the wire is broken. However, ANO has multiple examples of instances where protruding buttonheads were reported, but were determined to be continuous or “not broken”.

The original design bases calculation for the ANO-1 Reactor Building Post Tensioning System, shows that a total of seven wires can be missing (i.e. removed, broken, etc.) from each tendon and still be acceptable. Based on the actual inspection reports for tendon 31H28, there were no other missing or protruding buttonheads noted during the examination, and all remaining wires are effective. Therefore, if the two protruding buttonheads on tendon 31H28 were assumed to be broken or missing, then tendon 31H28 would still be operable and capable of performing its design function. Additionally, this calculation also analyzes the Post Tensioning System assuming two hoop (horizontal) tendons are ineffective. Therefore tendon 31H28 could be out of service or ineffective and the Reactor Building would still meet its design criteria.

A condition report was initiated to document this condition and establish operability of the Reactor Building. As part of the corrective action plan to address this condition, the condition report directed a work request to have this tendon detensioned and a wire sample taken from one of the protruding wires be prepared.

CAUSE OF CONDITION [IWL-3310(a)]:

Protruding buttonheads could be caused by broken wires or by workmanship during construction.

APPLICABILITY OF CONDITION TO THE OTHER UNIT [IWL-3310(b)]:

While conditions of this type are possible for ANO-2, this is considered to be an isolated incident. Furthermore, if errors of this type were wide spread, the nature of the error limits the impact such that the Reactor Building would continue to perform its design function.

ACCEPTABILITY OF CONTAINMENT [IWL-3310(c)]:

The onsite Responsible Engineer has determined that tendon 31H28 is acceptable and will continue to perform its design function. As a result, the Reactor Building is acceptable without further evaluation or repair/replacement activities.

REQUIREMENTS FOR REPAIR REPLACEMENT [IWL-3310(d)]:

As discussed under the Acceptability of Containment section above, no repair or replacement activities were required.

ADDITIONAL EXAMINATION REQUIREMENTS [IWL-3310(e)]:

No additional examinations are warranted for this condition.

2. Change In Size of Existing Concrete Cracks at Bearing Plate of Tendon 31H08

During the ANO-1 35-Year Tendon Surveillance and Concrete Inspection, two cracks exceeding 0.010” in width were noted around the bearing plate on buttress 3 for tendon 31H08. Both of these cracks were previously identified during the 25-Year Tendon Surveillance and Concrete Inspection and documented in a condition report. One of the two cracks was reported as 0.010” wide and 5” long and was unchanged as compared to the original identification during the 25-Year Surveillance. However, the other crack was reported as 0.040” wide and 12.5” long as compared to the original reporting of 0.030” wide and 13” long during the 25-Year Surveillance. This indicates an increase in crack width of 0.010” and a decrease in crack length of 0.5” over a period of approximately nine years (25-Year Surveillance was performed in 1999). This small increase in crack width over a time span of nine years could be attributed to factors such as heat or erosion of the concrete at the crack or possibly difference in reporting by inspectors. Regarding the decrease in crack length, it is impossible for a crack to “decrease” in length. If concrete is compressed at a crack, the crack width may decrease to point that it is not easily detected in which case the overall length may

"appear" to decrease. However, in this case, the crack was noted with a larger width versus a smaller width which does not correspond to this reasoning. Additionally, following a review of the actual field inspection forms completed during the 25-Year Surveillance, this second crack was actually noted as being "13" LG, > 0.030" wide" which indicates that the width may have actually been "greater than" 0.030" wide. Therefore, the most likely cause for this difference in reporting of this crack is due to the difference in inspectors.

CAUSE OF CONDITION [IWL-3310(a)]:

The minor difference in reported crack width from the 25-Year Tendon Surveillance to the 35-Year Tendon Surveillance could be caused by a combination of heat, erosion of the concrete at the crack, and the differences in reporting between inspectors.

APPLICABILITY OF CONDITION TO THE OTHER UNIT [IWL-3310(b)]:

While conditions of this type are possible for ANO-2, this is considered to be an isolated incident. Additionally, the IWL Tendon Surveillance and Concrete Inspection process is considered to be adequate to detect this same condition on ANO-2.

ACCEPTABILITY OF CONTAINMENT [IWL-3310(c)]:

The acceptability of the cracks being greater than 0.01" was originally evaluated, documented and accepted as part of the 25-Year Tendon Surveillance and Concrete Inspection. As mentioned above, the most likely cause for the difference in reported crack width is due to heat, erosion of the concrete at the crack and differences in reporting between the inspectors. This condition has been determined to be acceptable as is and tendon 31H08 continues to perform its design function. As a result, the Reactor Building is acceptable without further evaluation or repair/replacement activities.

REQUIREMENTS FOR REPAIR REPLACEMENT [IWL-3310(d)]:

As discussed under the Acceptability of Containment section above, no repair or replacement activities were required.

ADDITIONAL EXAMINATION REQUIREMENTS [IWL-3310(e)]:

No additional examinations are warranted for this condition.

3. Tendon 31H21 and 31H28 Accepted More Than 10% of Total Grease Capacity

Tendons 31H21 and 31H28 are new tendons installed during the nineteenth refueling outage (1R19) in early December 2005 as part of the Steam Generator Replacement Project. These tendons were not selected for inspection as part of the programmatic 35-Year Tendon Surveillance and Concrete Inspection. Instead they were inspected as part of the action plan for from a previous condition report which documented during the Steam Generator Replacement project the amount of grease pumped during replacement and greasing of these two tendons exceeded the average amount used for replacement tendons without any grease being detected at the field-end of the tendon. Per the condition report, the average amount of grease pumped per horizontal tendon is 220 to 250 gallons, however regreasing efforts for 31H21 and 31H28 have exceeded 300 gallons without detecting any grease at the field-end of the tendon. Immediate actions from this event included stopping the filling operations, initiating the condition report and establishing operability for the two tendons. Engineering performed walk downs immediately following the condition report initiation and during the following refueling outage to look for signs of grease leaks or bulges in the liner plate that would explain where the excess grease went. However, no such indications were found.

The goal during the twenty-first refueling outage (1R21), in 2008, was to perform a visual inspection of the tendon anchorage areas and attempt to complete a pump-through for both 31H21 and 31H28 tendons. Per IWL-3221.4, the absolute difference between the amount removed and the amount replaced shall not exceed 10% of the tendon net duct volume. As documented in the vendor report, upon regreasing of the tendons, tendon 31H21 accepted 15.55% of its net duct volume and tendon 31H28 accepted 13.63% of its net duct volume. A pump-through for both tendons was attempted, but was unsuccessful. Each end of both tendons was pressure pumped with grease at 50 psig and held for 30 minutes with no flow occurring during the 30 minutes. Even though a pump-through was not obtained, both ends of each tendon were pumped with grease thereby providing protection of these areas. The tendon caps were reinstalled with new gaskets as required. A condition report was generated to document this condition. Grease samples were taken on these tendons and results for both were within acceptable limits. Both tendons were found to exhibit 100% grease coating on the anchorage areas, no water was observed for either tendon, and corrosion levels for both tendons were within acceptable levels. As discussed above, two protruding buttonheads were discovered on the field-end of tendon 31H28.

The corrective action plan in place to address the condition of acceptance of more than 10% of total grease capacity and lack of pump through is to 1) perform a visual inspection of the anchorage areas of each tendon, 2) detension each tendon, and 3) pull a wire from each tendon for testing all during the next scheduled IWL Tendon Surveillance Inspection.

With respect to exceeding the allowable 10% of tendon net duct volume, similar conditions have been previously documented at ANO. The engineering evaluation for the ANO-1 25-Year Reactor Building Tendon Surveillance and Concrete Surface Examination documented grease voids > 10% net duct volume in tendons V40, V80, and V70 and documented that voids in the tendon sheathing may be attributed to the following:

- "Visconorust 2090P-4 has a coefficient of expansion of about 1% per every 20°F. Initial filling temperatures of the filler material range from 160 to 220°F. Cold weather conditions can cool the filler material to 40°F, giving a contraction of 6% to 9% of the net duct volume."

- Calculated voids between the wires of the tendon bundle are approximately 7% or greater of the net tendon duct volume. During the initial filling operation, the tendon bundle may have been cold (ambient temperature of 45 to 65°F) and as the filler material was pumped into the sheathing void, it solidified on the surface of the cold tendon bundle, leaving small voids between the wires. As the filler material gradually heated the tendon bundle, it is likely that the voids between the wires allowed migration of the filler material into the tendon bundle. Because this process is slow and gradual, it is reasonable to expect that it took place substantially after the filling operation was completed and possibly during the summer or at operational temperatures. In addition, this type of migration could also occur where the tendons are in contact with sheathing.

- Characteristics of the initial filling method may induce air entrapment into the filler material. Pumping operations can introduce air into the filler material which may add up to as much as 2% of the net duct volume.

Based on a review of historical temperatures for the Russellville area obtained from the internet, temperatures averaged in the 30˚Fs during the time frame these tendons were being installed. These low temperatures could make the first two scenarios above plausible causes. However, a pump through was not obtained for either tendon during the 35-Year Tendon Surveillance after each end was pressure pumped at 50 psig and held for 30 minutes without any flow into the tendon, would suggest that some form of blockage is present in each of the tendon sheaths. As stated above, an action plan to further investigate this condition is in place.

CAUSE OF CONDITION [IWL-3310(a)]:

As stated above, possible causes for this condition include cold temperatures during greasing operations of the tendons or possibly blockage of some form in the tendon sheaths.

APPLICABILITY OF CONDITION TO THE OTHER UNIT [IWL-3310(b)]:

While conditions of this type are possible for ANO-2, this is considered to be an isolated incident. Additionally, the IWL Tendon Surveillance and Concrete Inspection process is considered to be adequate to detect this same condition on ANO-2.

ACCEPTABILITY OF CONTAINMENT [IWL-3310(c)]:

The acceptance of greater than 10% of the net duct volume of corrosion inhibitor and lack of pump through for tendons 31H21 and 31H28 is accepted by evaluation. Apart from the two noted protruding buttonheads on tendon 31H28, no other adverse conditions were noted for these tendons during the surveillance. Grease was added to both ends of each tendon and the cans with new gaskets were reinstalled providing protection of both ends.

REQUIREMENTS FOR REPAIR REPLACEMENT [IWL-3310(d)]:

No repair or replacement activities are required as a result of these conditions.

ADDITIONAL EXAMINATION REQUIREMENTS [IWL-3310(e)]:

No additional examinations are required for this condition.

Based on the results of the 35-Year Tendon Surveillance and Concrete Inspection, Entergy concludes that the ANO-1 Reactor Building is capable of performing its design function and will remain capable of performing its design function until completion of the 40-Year Tendon Surveillance and Concrete Inspection. Additionally, the observed indications do not indicate the presence of degradation in inaccessible areas.