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A SCANA COMPANY

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

Ladies and Gentlemen:

Subject: VIRGIL C. SUMMER NUCLEAR STATION
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
CONTAINMENT TENDON SURVEILLANCE REPORT

South Carolina Electric & Gas Company (SCE&G) is submitting this report pursuant to the requirements of Technical Specification 6.8.4.h.

The Virgil C. Summer Nuclear Station (VCSNS) tendon surveillance program is based on the 1992 Edition with 1992 Addenda ASME Code Section XI, Subsection IWL and five modifications presented in 10CFR50.55a. The Sixth Period Tendon Surveillance (20th year) for VCSNS was performed from September to December 2000, prior to and during the 12th Refueling Outage. This was the first surveillance to be conducted under the rules of ASME Section XI, Subsection IWL. The controlling documents for the inspection were the applicable Engineering Specification and plant Surveillance Test Procedure (STP 160.001). The inspection was completed on February 21, 2001, and associated procedural signoffs documented that the measured tendon liftoff forces met the requirements for operability contained in the Surveillance Test Procedure and the containment was declared operable.

The following information is submitted to provide the NRC with the data required by Technical Specification 6.8.4.h.

ENGINEERING EVALUATION OF CONTAINMENT STRUCTURE DEGRADATION:

V. C. Summer Technical Specifications 6.8.4.h requires any degradation exceeding the acceptance criteria of the containment structure detected during the Containment Inservice Inspection Program undergo an engineering evaluation and the results of that evaluation be reported to the NRC. As stated previously, the requirements for containment operability were evaluated and determined to be satisfactory at the completion of the inspection during the 12th refueling outage. No tendons or groups of tendons inspected were determined to be seriously degraded, however three conditions were encountered that did not meet the acceptance criteria of the implementing Surveillance Test Procedure. Each of these three conditions is discussed below in detail.

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Condition 1:

Section 7.1.2 of STP-160.001 states the following:

7.1.2 The measured force in each individual tendon is not less than 95% of the predicted force unless one of the following conditions is satisfied:

A. The measured force in not more than one tendon is between 90% and 95% of the predicted force.

B. The measured forces in two tendons located adjacent to the tendon in Paragraph 7.1.2 A. are not less than 95% of the predicted forces.

C. The measured forces in all the remaining sample tendons are not less than 95% of the predicted force.

During the tendon surveillance, the measured liftoff force for horizontal tendon H41AC was between 90% and 95% of the predicted value. Per STP-160.001, the two adjacent tendons, H40AC and H42AC, were tested. The liftoff force measured in H42AC was acceptable (greater that 95% of the predicted value) and the measured liftoff force in H40AC was between 90% and 95% of the predicted value. Subsequently, tendon H39AC was tested and it too had a measured liftoff force between 90% and 95% of the predicted value. Based on the data collected, the group average liftoff force for the horizontal tendons was greater than the required minimum (1095 kips average versus 1000 kips required). The regression analysis showed that adequate force in the tendon would remain through the current forty-year plant license. The measured liftoff forces for the horizontal tendons were determined to be acceptable based on the regression analysis.

During the tendon surveillance, the measured liftoff force for dome tendon D208 was between 90% and 95% of the predicted value. Per STP-160.001, the two adjacent tendons, D207 and D209, were tested. The liftoff force measured in tendon D209 was acceptable (greater than 95% of the predicted value) and the liftoff force measured in tendon D207 was between 90% and 95% of the predicted value. Subsequently, the liftoff force in tendon D206 was measured and was acceptable (greater than 95% of the predicted value). Based on the data collected, the group average liftoff force for the dome tendons was greater than the required minimum (1110 kips average versus 1063 kips required). The regression analysis showed that adequate force in the tendon would remain through the next surveillance period and was not projected to fall below the required minimum until approximately 2016. The liftoff forces for the dome tendons were determined to be acceptable based on the regression analysis.

After a review of the liftoff data, it was determined that the low liftoff values are a result of the test procedure and are acceptable based on the regression analysis of the groups. The liftoff values were lowered by twist in the tendon and by the tendon profile. The current procedure for obtaining liftoff values at VCSNS first determines the measured force at the point of feeler gage withdrawal at each of the tendon's two shim stacks. Provided those measurements are within 40 kips of each other, the average of the two values is determined. This process must be repeated for each tendon three times with consecutive readings all being within 25 kips. The liftoff value is then determined to be the highest of the 3 values. Industry practice is to take the

highest force measurement reading from the last point of feeler gage withdrawal from both of the shim stacks of the tendon with three consecutive readings being within 25 kips.

Several liftoff readings were taken on additional tendons because the 40 kips difference criteria was not being achieved. During continued liftoff testing, one tendon with a particularly large difference was corrected when the tendon head rotated and the twist in the tendon wire was relieved. The resulting force difference between shim stacks came within the 40 kips tolerance but the average liftoff force value dropped.

Based on this observation, the liftoff forces using the higher readings from the shim stacks and within 25 kips for three consecutive readings were generated. This data showed vertical liftoff forces have little change (0.13%) while hoop tendons gained moderately (0.55%) and the dome tendons gained a significant amount (1.15%). This increase correlates to the amount of bend in the tendon profile and the effects of bend on tendon twist during the installation and stressing. Based on using the highest value of liftoff instead of the average of the liftoff measurements from the shim stacks, the liftoff values for the dome tendons improved enough to place all of the measured liftoff values above 95% of the predicted values. The liftoff forces generated for the hoop tendons were slightly higher but still did not go above the 95% of the predicted force threshold.

SCE&G has concluded that the current procedure for measuring liftoff force is providing lower liftoff values than actual on all tendons with the dome tendons being most affected. SCE&G will continue to monitor the trend in measured liftoff force as it relates to the predicted valued in future regularly scheduled surveillances and will modify the test criteria to be more inline with typical industry practices, as necessary.

In accordance with procedural requirements, each tendon with a measured liftoff force less than 95% of the predicted value was re-tensioned and the force was restored to within -0%, +3% of the predicted value.

Condition 2:

Section 7.3 of STP-160.001 states the following:

7.3 Acceptance of sheathing filler is the Responsible Supervisor's evaluation of the Test Results. The following criteria will be considered by the Responsible Supervisor in the evaluation.

7.3.6 Grease voids - Absolute difference between amount removed and amount replaced is less than or equal to 10% of the tendon net duct volume.

During the tendon surveillance, the difference between the amount of grease removed and the amount of grease replaced exceeded 10% of the tendon net duct volume for tendons D302 (18.1% of the duct volume) and V90 (12.3% of the tendon duct volume). Tendon V90 was found to have loose grease cap bolts and evidence of grease leakage. Although the exact quantity of grease leakage is not available, it may be assumed that leaks caused by loose bolts have caused the increase in grease void volume.

No readily apparent cause of the increase in grease void volume for tendon D302 could be determined. No evidence of grease leakage or loose bolts was observed and no free water was observed when the end cap was removed. No other indications of grease leakage along the length of the tendon duct were observed. Therefore, it is assumed that the tendon duct was not completely filled during the original installation. To determine if this is an isolated case, the void volume for adjacent tendons D301 and D303 will be determined during the next scheduled tendon surveillance (Spring 2005).

Both tendons V90 and D302 were repaired by replacing the gasket and refilling the tendon duct with grease.

Condition 3:

Section 7.4 of STP-160.001 states the following:

7.4 Perform a general visual examination of the containment surface for grease leakage. Acceptance criteria for grease leakage inspection is the Responsible Supervisor's evaluation of the Test Results.

During the tendon surveillance, an active grease leak was noted on the field end of tendon D132. This grease leak was repaired by replacing the gasket and filling the end cap with grease.

Grease leakage was detected on 62 of the vertical tendon bottom end caps in the Tendon Access Gallery. Twenty-seven (27) of these end caps were reported as leaking during the 1996 tendon inspection, but no record of leakage prior to that time was identified. In 1989, all the vertical tendons were re-tensioned. The top vertical end caps were re-filled during this operation. From a review of the records it is concluded that the vertical tendons were overfilled and no void space was left to accommodate thermal expansion of the grease.

The bolts in several of the leaking bottom grease caps were checked for tightness. Loose bolts were found on only two end caps (V73 and V90, previously described). The grease levels were also checked at several of the top vertical end caps. Though the grease levels were lower than would be expected for thermal shrinkage alone, the additional void is attributed to leakage thru the lower seal that has occurred subsequent to the initial volume loss occurring due to thermal expansion. The calculated losses were less than 10% of the net tendon duct volume for all of the additional end caps inspected. Additionally, the leakage of the bottom vertical end caps was determined to be acceptable because all components of the vertical tendons that were visually inspected were coated with grease and had no evidence of corrosion.

A plan will be developed to replace leaking gaskets during cold weather months (to minimize grease loss when bottom end caps are removed) by June 30, 2003. Gasket replacement will be completed prior to May 1, 2004. Prior to gasket replacement, proper grease expansion void criteria will be developed to prevent this same leakage from developing again.

Should you have any questions, please call Mr. Mel Browne at (803) 345-4141 at your convenience.

Very truly yours,

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