KANSAS GAS AND ELECTRIC COMPANY

GLENN L. KOESTER
VICE PRESIDENT - NUCLEAR

March 6, 1986

RECEIVED
MAR 10 1986

Mr. R. D. Martin, Regional Administrator
U.S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

KMLNRC 86-038
Re: Docket No. STN 50-482
Subj: Special Report 86-01

Dear Mr. Martin:

The enclosed Special Report is submitted pursuant to Technical Specifications 3.6.1.6 and 6.9.2.

Yours very truly,

Glenn L. Koester

Glenn L. Koester
Vice President - Nuclear

GLK:see

cc: PO'Connor (2)
JCummins

8603170301 860306
PDR ADOCK 05000482
S PDR

86-251

IE 31
3 - 1/1

SPECIAL REPORT 86-01

Inservice Tendon Surveillance
Voids In Excess of 5 Percent Of Net Duct Volume

This special report is being submitted pursuant to Technical Specifications 3.6.1.6, action statement b, and 6.9.2 concerning the discovery of voids in excess of 5 percent of the net duct volume, thus exceeding the acceptance criteria of surveillance 4.6.1.6.1.e.1.

The first year tendon surveillance at Wolf Creek Generating Station (WCGS) began January 27, 1986. The surveillance inspection procedures required in part, inspection of tendon wire and anchorage components for evidence of corrosion and/or cracking, inspection of concrete adjacent to the bearing plates for cracks, inspection of the tendon system for signs of water intrusion, verification of tendon lift-off force and elongation, and the measurement of sheathing filler grease voids expressed as a percentage of the net duct volume. Figure 1 illustrates details of a typical vertical tendon anchorage and grease can assembly.

Technical Specification Surveillance 4.6.1.6.1.e.1 requires in part, that the OPERABILITY of the sheathing filler grease be assured by verifying that no voids in excess of 5 percent of the net duct volume exist. In order to assess the percentage of voids in the sheathing filler grease, hot grease is pumped into the tendon duct under pressure and the volume of grease added by this method, less the volume of grease removed from the tendon duct and grease can assembly during tendon inspection, is compared to the net duct volume. The pumping pressure was limited to assure that no damage to the containment structural integrity would occur during this process. This regreasing operation was performed on the eleven containment vessel tendons inspected during the surveillance.

During regreasing it was identified that the net refill volumes of the sheathing filler grease exceeded 5 percent of net duct volume for tendons listed below:

Tendon Number	Percent Voids Of Net Duct Volume	Date Discovered
1CB	7.3	2/21/86
51BA	8.1	2/25/86
45BA	6.7	2/26/86
9AC	5.5	2/26/86
9CB	6.6	2/26/86

These percentages reflect the amount of sheathing filler grease added to the tendon ducts themselves and their associated grease can.

Technical Specification 3.6.1.6 Action b requires that, "With any abnormal degradation of the structural integrity . . . at a level below the acceptance criteria of Specification 4.6.1.6, restore the containment vessel to the required level of integrity within 72 hours and perform an engineering evaluation of the containment and provide a Special Report to the Commission within 15 days in accordance with Specification 6.9.2..." Pursuant to this action statement Kansas Gas and Electric Company (KG&E) has determined that the process used to measure and identify the voids in the sheathing filler grease immediately, " . . . restores the containment vessel to the required level of integrity . . .", provided no other evidence of abnormal degredation is present, by filling the identified voids with sheathing filler grease.

Based on preliminary inspection and test results of additional aspects of the post tensioning system for the inspected tendons it was confirmed that the presence of voids in excess of 5 percent of net duct volume does not degrade the structural integrity of the Containment. The amount of grease found in each can was more than adequate as all tendon wires and anchorage components had extensive grease coverage. There were no signs of water or evidence of corrosion within the tendon ducts or grease can assemblies. Additionally there was no evidence of concrete cracking adjacent to the tendon anchorages.

Prevention of corrosion of the tendons is assured by adequately coating the tendon wires and anchorage components. The material used in the WCGS post-tensioning system, Visconorust 2090P-4, accomplishes its corrosion protection function by the filler material's affinity to adhere to steel structures, its ability to emulsify any moisture in the system nullifying its rusting ability, and by its resistance to moisture, mild acids and alkalis. As long as sufficient grease has been introduced into the system to coat the wires and anchorages completely, corrosion protection is assured. Protection is also afforded by each tendon wire being individually precoated with Amber 1601 prior to installation. The degree of filling the interstitial spaces, which comprise the net duct volume, is not directly related to the degree of coating which occurs and, consequently, is not of significant importance as an indicator of operability of the sheathing filler material.

Due to the physical characteristics of the sheathing filler material and industry standard installation techniques, voids up to approximately 15 percent could be expected after the initial filling operation. Voids in the tendon sheathing may be attributed to a number of addition factors:

> Visconorust 2090P-4 has a coefficient of expansion which yields an expansion of about 1% per every 20 F. Initial filling temperatures of the filler material can average 160 F. Cold weather conditions can cool the filler material to 40 F, giving a contraction of 6% of the net duct volume.

Calculated voids between the wires which comprise the tendon bundle are approximately 7% of the net duct volume. If during the initial filling operations the tendon bundle is cold (ambient temperature of 65 F.) and, as the filler material is pumped into the sheathing void, it solidifies on the surface of the tendon bundle, small voids will be left between the wires. As tendon bundles gradually heat and cool over time, it is likely that the voids between the wires allow migration of the filler material into the tendon bundle. In addition, this type of migration could also occur at other areas such as where tendons are in contact with the sheathing.

Characteristics of the initial filling method may induce air entrapment into the filler material. Pumping operations can introduce air into filler material and may add up to as much as 2% of the net duct volume. This void value could be higher for horizontal tendons due to the lower pumping head used when compared to the vertical tendons.

In summary, even under optimum filling conditions, voids of approximately 15% could be expected after the initial filling operations.

Based on the above discussions it has been determined that the identification of sheathing filler grease voids in excess of 5 percent of the net duct volume alone is not evidence of degradation and does not adversely affect the structural integrity of the Containment Building. The basis for this conclusion was previously presented in letter KMLNRC 85-264, dated December 6, 1985.

VERTICAL TENDON (Gallery - In Detail)

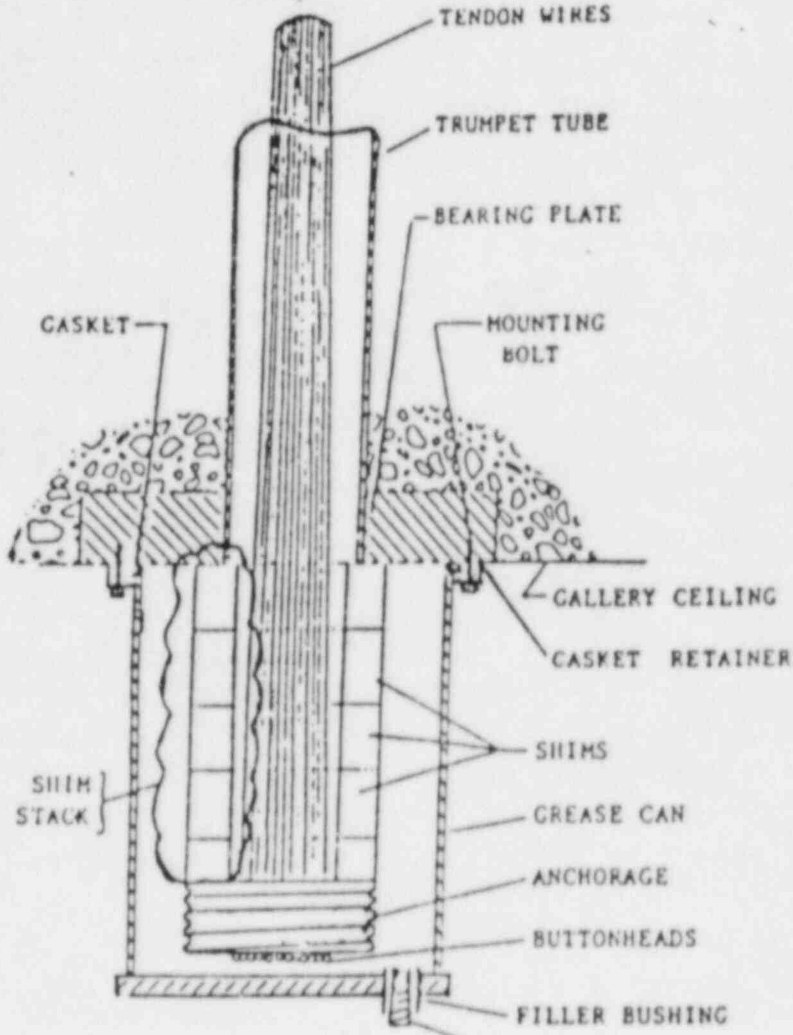

FIGURE 1