

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

September 18, 1981

BLRD-50-438/81-49

Mr. James P. O'Reilly, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region II - Suite 3100
101 Marietta Street
Atlanta, Georgia 30303



Dear Mr. O'Reilly:

BELLEFONTE NUCLEAR PLANT UNIT 1 - LOCKOFF PRESSURE ON POSTTENSIONING
SYSTEM - BLRD-50-438/81-49 - SECOND INTERIM REPORT

The subject deficiency was initially reported to NRC-OIE Inspector R. V. Crlenjak on July 17, 1981 in accordance with 10 CFR 50.55(e) as NCR BLN CEB 8104. This was followed by our first interim report dated August 17, 1981. As discussed with J. Lenahan by telephone on August 20, 1981, enclosed is our second interim report. We expect to submit our next report by November 24, 1981. We consider 10 CFR Part 21 applicable to this deficiency.

If you have any questions concerning this matter, please get in touch with D. L. Lambert at FTS 857-2581.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills

L. M. Mills, Manager
Nuclear Regulation and Safety

Enclosure

cc: Mr. Victor Stello, Jr., Director (Enclosure)
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

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ENCLOSURE
BELLEFONTE NUCLEAR PLANT UNIT 1
LOCKOFF PRESSURE ON POSTTENSIONING SYSTEM
BLRD-50-438/81-49
10 CFR 50.55(e)
SECOND INTERIM REPORT

Description of Deficiency

Inryco, Incorporated has been contracted (contract 75C53-85380) to supply and install the posttensioning system for the primary containment structures. Allowable lockoff stresses for each tendon have been established by Inryco in accordance with the April 1973 Trial Use Version of the ACI 359 code and the contract specifications. These lockoff stresses are required to provide assurance that the containment structure will have adequate prestress force to perform its intended safety function.

In order to resolve a problem with certain stressing gauges being out of calibration, Inryco performed liftoff tests on several horizontal tendons. These liftoff tests revealed that, in several cases, lockoff stresses were substantially lower than predicted.

Interim Progress

In the first interim report on this deficiency, Inryco's program for investigation was outlined. Following is a brief summary of the findings to date.

Inplace tendon liftoff readings taken on a random sample basis on unit 1 revealed that the majority of the tendons are exhibiting liftoff stresses substantially lower than the allowable lockoff range during original stressing of the tendon. A review of the material certifications for the tendon wire revealed that the tendons sampled were fabricated with wire manufactured by NDI or by Florida Wire and Cable Company (FWC). The NDI wire is 4-percent relaxation wire while FWC wire is 8-1.2 percent relaxation wire. As would be expected, the tendons fabricated with FWC wire exhibit lower liftoff stresses than the tendons fabricated with NDI wire. However, the differences are not substantial.

Steps have been taken to perform physical and chemical testing of the FWC and NDI wire. To date, no results have been submitted to TVA.

Further testing has been initiated since the first interim report on this deficiency. Inryco attributes the low liftoff readings to "load equalization." In short, their theory states that with time the stress in a tendon will equalize lengthwise. Because of the initial loss in stress lengthwise in a tendon because of friction, it would be expected that the stress in the lengthwise center of the tendon would increase in time and the anchorage stress would decrease. TVA required that Inryco substantiate their theory with physical evidence. To this end, Inryco has performed a friction test to verify the assumed friction coefficient and is currently performing tests to ascertain whether or not "load equalization" does occur.

The friction test has been completed and has served to experimentally verify the friction coefficient. Inryco had expected the coefficient to be 0.08 while TVA used a conservative value of 0.13 in preliminary design calculations. The experimental value was 0.10 with a standard deviation of 0.062. Therefore, the friction test produced uniform results and exhibited a normal distribution since the largest difference in values was 0.02. Currently consideration is being given to why the experimental value differs from that found on other nuclear projects. In addition, the "load equalization" test is being conducted. Additional information will be provided upon completion of this testing. At this point, no corrective action has been established.

The stressing gauges and stressing jacks have been checked for calibration and repeatability. TVA has not been notified of any problems with the stressing equipment. However, equipment problems or procedural problems with tendon stressing have not been ruled out at this time as being a possible contributor to the low liftoff problem.