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June 15, 1984
Fort St. Vrain
Unit #1
P-84174

Mr. Eric H. Johnson
Chief, Reactor Project Branch 1
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

SUBJECT: Tendon Surveillance Program

REFERENCE: 1. PSC Letter, dated April 12, 1984, Warembourg to Collins

2. NRC Letter, dated May 16, 1984, Johnson to Lee

Dear Mr. Johnson:

This letter is in response to your letter (Reference 2) dated May 16, 1984 wherein you requested the details of our proposed tendon surveillance program within thirty days of receipt of your May 16, 1984 letter. The surveillance program as proposed, in general terms, in our letter dated April 12, 1984 (P-84110) will be contained in two surveillance tests: the existing surveillance SR-RE-42M to monitor and record load cell data on the twenty-seven (27) tendon load cells on a monthly basis and a new surveillance currently being written to provide the capability to monitor the PCRV tendons for signs of any further degradation.

The basis for the tendon surveillance program is to use a systems approach whereby each specific type of tendon anchor assembly is examined using sampling techniques to detect any further degradation of the tendons and to provide assurance that the PCRV is capable of meeting its design conditions for operation. To accomplish the systems approach, the tendons have been divided into four categories: Longitudinal, Top Cross Head, Circumferential and Bottom Cross Head. Table 1 (attached) which is to be used in the surveillance test, provides the necessary guidance to facilitate the required sample

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size from each group. In addition to the required number of tendons to be sampled on a semiannual basis, one tendon in each group will be examined every interval to serve as a controlled monitor. These control tendons are specified in the "Test Anchor Assembly" column. The "test" assemblies for the longitudinal, circumferential and bottom head tendons were selected from those having failed strands during the ISI inspection in April, 1984. The top cross head "test" tendon was selected on the basis of ease of access because there were no indications of failed strands in the top cross head tendons during the ISI surveillance. With reference to Table 1, note that 100% of one anchor assembly end of the accessible tendons for the longitudinal and bottom cross head tendons are being visually inspected during each refueling cycle (18 months). These two groups of tendons comprised the majority of tendons having failed strands and are therefore being visually inspected using larger sample sizes to assist in detecting any further degradation in the tendons. The basis for the 5% sample of accessible tendons for the top head and circumferential groups is to remain consistent with the ISI sample rates and the fact that very few tendons from these groups have indications of failed strands.

The visual inspection surveillance test is being set up to "ratchet" down from a semiannual to quarterly surveillance based upon any further indications of failed strands in at least 15% of the sample population of previously inspected tendons as specified by Table 1. It is therefore possible that one group, such as circumferential, could remain on a seminannual inspection frequency while another group could be on a quarterly frequency. The monthly "ratchet" criteria is identical to the quarterly in that if 15% of the sample population of previously inspected tendons as specified in Table 1 in the "Quarter" column exhibit unrecorded indications from previous inspections, that group would be placed on a monthly inspection cycle. Additionally, just as an increase in recorded strand indications will cause an increase in inspection frequency, a sustained stabilization in a tendon (no new strand failures over two inspection intervals) will allow a decrease in inspection frequency.

The twenty-seven (27) tendons equipped with load cells, in addition to providing a constant, alarmed, monitoring of samples from each tendon group, will be used to trend the tendon groups to provide a degree of confidence for each tendon group. Should the results of the monthly load cell trending indicate abnormal relaxation in any group, the visual inspection surveillance will be implemented to inspect adjacent tendons around the load cell tendon.

It is not anticipated that further tendon "lift offs" will be necessary unless the effective strands on any tendon approach one hundred and fifteen per cent of the minimum allowable number.

The basis for the 15% indications to decrease inspection frequency and the 15% of minimum allowable effective strand criteria is based upon the ISI inspections in April, 1984. These visual examinations of strands behind the shim stacks on tendons having strand failures have shown additional strands with corrosion. Some of the strands are expected to fail due to cycling of PCRV pressure or tensioning/detentioning without necessarily affecting a tendon's capability to meet minimum design requirements.

In addition to the surveillance inspections discussed above, we are experimenting with the use of ultrasonic techniques to provide a better method of verifying strand/tendon integrity. If these tests prove to be acceptable, it is conceivable that the integrity of a tendon could be verified using ultrasonics without having to consider lift off testing as a final minimum design verification method. We are also experimenting with tendon cap atmoshperic samples to provide further indications of corrosive attack. This test is also at the experimental stage and cannot be relied upon to provide conclusive evidence regarding further corrosive conditions since there is no baseline data. We will continue our efforts to refine these techniques and will inform you at a later date should either of these experiments prove effective.

As stated earlier, we are in the process of writing the visual examination surveillance test and will be revising SR-RE-42M in June, 1984. The effective "start" date for the surveillance is June 1, 1984 which would require the next inspection to be on December 1, 1984, ± 25% of the interval.

The tendon surveillance program described herein was developed using the Reg. Guide 1.35 as a reference. All discussions regarding incorporation of the proposed visual surveillance program into the Technical Specifications should be directed to either Mr. Don Warembourg or Mr. Chuck Fuller.

Very truly yours,

Don W. Warembourg

Don W. Warembourg
Manager, Nuclear Production
Fort St. Vrain Nuclear
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DWW/djc

Attachment

TABLE 1

TYPE ANCHOR ASSEMBLY	18 MONTH	% Of ACCESSIBLE ANCHOR HEADS	TEST ANCHOR ASSEMBLY	NUMBER OF ANCHOR ASSEMBLIES TO BE INSPECTED		
				SEMIANNUAL	QUARTER	MONTH
Longitudinal	89	100	VM-30 Location Top Head	30	15	5
Top Head	3	5	TO^{L}-U1 Location Face II-III	2	1	1
Circumferential	32	5	CI-1.5 Location Pilaster I-L	11	6	2
Bottom Head	44	100	BI^{L}-U4 Location Face IV-V	16	8	3