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Director, Nuclear Reactor Regulation  
Att Mr Dennis M Crutchfield, Chief  
Operating Reactors Branch No 5  
US Nuclear Regulatory Commission  
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 -  
PALISADES PLANT - SEP TOPIC III-7.A, ISI INCLUDING PRESTRESSED CONCRETE CONTAINMENTS  
WITH EITHER GROUTED OR UNGROUTED TENDONS

By letter dated August 25, 1981 the NRC issued for comment a draft evaluation of  
SEP Topic III-7.A for the Palisades Plant. Attached are the Consumers Power  
Company comments on that document.

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SEP SAFETY TOPIC EVALUATION  
PALISADES PLANT  
REVIEW OF NRC EVALUATION FOR  
TOPIC III-7.A, ISI INCLUDING  
PRESTRESSED CONCRETE CONTAINMENTS  
WITH EITHER GROUTED OR UNGROUTED TENDONS

The following information documents our review of the NRC Draft Evaluation regarding this topic. Our comments are shown using paragraph designations as they appear in the NRC Draft Evaluation.

V. Evaluation

Page 3, Paragraph 3

The ten-year containment building tendon surveillance (ISI) was started in May 1981 and completed prior to issuance of the draft evaluation. The NRC Staff on site, in Washington and Chicago were notified of this inspection.

V. Evaluation

A. Current Criteria

Page 4, Paragraph 1 -

The Draft Evaluation needs clarification. The original plant Technical Specifications were written prior to the issue of Regulatory Guide 1.35. The one- and three-year ISIs were conducted using the original plant Technical Specifications which defined the number of tendons to be inspected in these years.

Subsequent to the three-year ISI, it was apparent the definition of tendon "lift-off" was subject to individual interpretation and needed to be objectively defined, Reference (1). In the period between the three- and five-year ISI, the Architect Engineer and Consumers Power Company performed additional work to develop a measurement technique that would appropriately define tendon "lift-off." The tendon lift-off measurement technique that was developed, called "all shims loose," was found to be the least subject to interpretation.

During the above period, the overall ISI program was changed to make it consistent with Regulatory Guide 1.35. Specific Technical Specifications revisions were as follows:

- (1) To increase inspection frequency of ISI to provide assurance that the tendon system is performing as designed or to provide more rapid detection of any deterioration of the tendon system if it should occur.

- (2) To increase the data base sample size of tendons (21 tendons) to be inspected in the five-year ISI because of the questionable results found during the one- and three-year ISI.
- (3) To change the acceptance criterion for measured tendon lift-off force determination:

From: A previous requirement to plot and extrapolate measured lift-off forces to forty years (forming a force/time trend line).

To: Require measured lift-off forces to fall between upper and lower bounds without extrapolation of data points as proposed in Regulatory Guide 1.35 and the Standard Technical Specifications, Ref (2).

Approval for these revisions appeared in Amendment #14 to Provisional Operating License #DPR-20 for Palisades which included Change #18 to the Technical Specifications. The five-year ISI was based on these revisions.

The ten-year inspection criterion (sample size of nine tendons) is correct as stated in the Draft Evaluation.

Page 4, Paragraph 3

Draft Evaluation states "Acceptance criteria are that the prestress force for each tendon should be within the limits predicted for the time of test." This requirement is questionable since it now makes acceptance and the amount of tendons in the sample a function of the designer's ability to predict very small loss values. Losses are originally conservative based on testing; and using these losses, the minimum amount of prestress in the average tendon is determined. If prestress limit is too loose, then the criteria may be meaningless; if too tight, the sample may increase by a large amount causing unnecessary work and difficulties in analysis even though the containment is sound.

B. Testing Requirements at Palisades

Page 5, Paragraph 1

Add underlined information to Draft Evaluation. "After the three-year tests, the specifications were changed to conform with Regulatory Guide 1.35 and Standard Technical Specifications, Reference (2) and were used during the five-year ISI (test).

C. Discussion

Page 6, Paragraph 2

The Draft Evaluation states "Measured tendon forces for each tendon should be within these limits and not average tendon force." Our Architect Engineer uses average tendon force. They feel the acceptance criteria should be based on (a) the average lift-off of the sample since the original design was based on the average tendon and (b) the minimum effective force required and not some arbitrary predicted value.

Our records show a difference of opinion between our Architect Engineer and the NRC Staff regarding the average tendon force (and other techniques), References (3) and (4). Resolution of this issue is not known by Consumers Power Company.

Page 7, Paragraph 1

The data resulting from the one- and three-year ISI were considered questionable because of apparent variations in tendon lift-off force caused by measurement technique, Reference (1). The one- and three-year ISI shows normalized tendon lift-off results because of the requirement in the Technical Specifications in effect at that time. The five-year ISI was based on using the acceptance criteria set forth in the revised Technical Specifications. Reference our comments under Section V-A, Page 4, Paragraph 1. Consequently, normalization was not necessary.

Page 7, Paragraph 2

We agree with the draft evaluation that a force/time graph should be maintained. However, because of the variations found in the tendon lift-off forces caused by measurement technique in the one- and three-year ISI, the force/time graph was not maintained.

The lift-off forces for the five-year ISI were presented in bar graph form because this represents the only set of data available using our current accepted measurement technique, "all shims loose." As the ten-year, fifteen-year, etc, ISI tendon lift-off results become available, they will be plotted with the 5-year results using a force/time graph.

Page 7, Paragraph 3

The Draft Evaluation states "the minimum effective design prestress value and the predicted prestress value converge as time progresses. Therefore, . . . . As a result, it is expected that more tendons will exhibit values below the minimum effective design prestress value in the future." If this proves to be correct, then the approach taken by the Architect Engineer in Reference (3) would be appropriate and would still provide assurance that the containment is sound. Furthermore, our Technical Specifications already specifies that measured lift-off forces should fall between absolute upper and lower bounds with the lower bound providing a minimum effective prestress value for tendon types.

This minimum value is fixed (not a variable) and could not be changed without a further evaluation of ISI program. If, for some reason, the ISI shows the lift-off force of a given tendon, dropping below the minimum value, an evaluation is required for the tendons on either side of the one in question to provide resolution. Furthermore, we have already increased the ISI inspection frequency to provide a more rapid detection of any deterioration in the tendon system if it should occur, Reference (5).

It is believed our current ISI requirements in the Technical Specifications are more conservative than those shown by the Architect Engineer, Reference (3), and probably as conservative as the theoretical ISI requirements shown in the Draft Evaluation by the NRC and in Reference (4).

Page 8, Paragraph 1

Problems associated in the one- and three-year ISI were discussed earlier; reference our comments under Section V-C, Page 7, Paragraph 2. Normalization of tendon lift-off values was addressed earlier; reference our comments under Section V-C, Page 7, Paragraph 1.

Page 8, Paragraph 2

It is our understanding that the sample size for the one- and three-year ISI was within the requirements of the Technical Specifications in effect at that time.

VI. Conclusions

Page 8, Paragraph 2 (cont'd Page 9)

A graphical presentation of the tendon lift-off results will be made in future ISI reports; reference our comments under Section V-C, Page 7, Paragraph 2.

Page 9, Paragraph 1

Contrary to the Draft Evaluation, we believe the one- and three-year ISI data (regarding tendon lift-off force) should be ignored because of questionable results caused by measurement techniques, Reference (1). Therefore, this data should not be plotted on the same graph.

The data base for tendon lift-off forces should only include results from the five-year ISI (1975) and later ISI which use our acceptable measurement technique of "all shims loose." Normalization has already been addressed.

Page 9, Paragraph 2

Normalization has already been addressed.

Page 9, Paragraph 3

During the development of our current ISI, many differences of opinion have surfaced over the past decade regarding acceptance criteria. Examples of these differences are shown in References (3), (4) and (5). The acceptance criteria specified in this Draft Evaluation represents another change in position by the NRC Staff which is confusing to Consumers Power Co and our Architect Engineer. Contrary to the Draft Evaluation, we believe that no changes should be made to the current Technical Specifications until Revision 3 to Regulatory Guide 1.35 is issued. Our current ISI program is adequately performing its intended function and no specific safety concerns are outstanding at this point in time.

Page 9, Paragraph 4

We have already increased our inspection frequency during ISI to provide a more rapid detection of any deterioration of the tendon system if it should occur. Reference our comments under Section V-A, Page 4, Paragraph 1 and Reference (5).

Page 10, Paragraph 1

It is our understanding that the sample size for the one- and three-year ISI was within the requirements of the Technical Specifications in effect at that time; reference our comments under Section V-C, Page 8, Paragraph 2.

We agree with the Draft Evaluation that the one- and three-year ISI prestress values should be viewed with some caution; in fact, they should be ignored because of the change in measurement technique. The five-year ISI program used a measurement technique of "all shims loose," ie, the moving of a matched or mated pair of shims to determine tendon lift-off force.

Page 10, Paragraph 2

The ILRT and ISI are not completed in the same time frame (period).\* This makes the request in the Draft Evaluation for inspection of cracks in the concrete surrounding the end anchorage of tendons (tested in the previous ISI), a safety concern and extremely costly because ISI requires work high above the ground level and special equipment. A crane, skydivers, etc are necessary to provide access for the tendons to be inspected; special rigging of this equipment is necessary.

We are inspecting for cracks in the concrete during ISI, Reference (6), and believe from our findings that this additional inspection is not warranted and would have little value in determining containment integrity. It should also be noted that the ILRT is conducted at approximately one-half containment design pressure (Pa), not at maximum (test) pressure as shown in the draft evaluation.

Because of the above and with no requirement for this additional inspection in the Technical Specifications, we conclude this requirement is not necessary.

Please note the Draft Evaluation also addresses the ILRT in two previous paragraphs; reference Section V-A, Page 4, Paragraph 1 and Section V-C, Page 8, Paragraph 3

Page 10, Paragraph 3

The ten-year ISI was completed prior to issuance of this Draft Evaluation; reference our comments under Section V.

\*ISI is now completed every five years and normally performed in good weather conditions while the ILRT is performed during a refueling outage which is not contingent on weather conditions.

We agree with the Draft Evaluation to include tendons BF-65 and D 1-38 in the next ISI inspection. We do not, however, agree to select an additional random tendon as proposed, as we have already completed our ten-year ISI which includes tendon selection on a random basis. All the tendons inspected in the ten-year ISI met the lift-off acceptance criteria in the Technical Specifications. A report to the NRC is forthcoming.

Page 10, Paragraph 3 (Cont'd Page 11)

The Draft Evaluation states "BF-65 and D 1-38 appear to be losing prestress at a substantially faster rate than expected. Even viewing one- and three-year dome tendon results with caution, it appears that the dome tendons may be losing prestress faster than predicted." Even though we have committed to inspecting tendons BF-65 and D 1-38 above, we believe these conclusions could not have been reached based on data from the one- and three-year ISI because of questionable results from measurement techniques; reference our comments under Section VI, Page 9, Paragraph 1. The data base for tendon lift-off forces should start with the five-year ISI (1975) results; reference our comments under Section VI, Page 9, Paragraph 1.

Page 11, Paragraph 1

We agree with the Draft Evaluation that any proposed changes should wait until Revision 3 of the Regulatory Guide 1.35 is issued. However, we do not agree with all the proposed changes in the Draft Evaluation (the changes agreed to have been so stated) and strongly feel the NRC Staff should allow older plants certain flexibility when changing Regulatory Guides so that they can maintain continuity in the current ISI program if there are no safety concerns for the general public. Apparently, our containment meets this requirement; reference Section VI, Page 8, Paragraph 1 in the Draft Evaluation.

We believe that because of our very conservative containment design, the current ISI program which conforms to the early Regulatory Guide 1.35 and the standard Technical Specifications, Reference (2) and the satisfactory results obtained from the five- and ten-year ISI, that our current inspection program should be maintained at this time. As shown in our comments under Section VI, Page 9, Paragraph 3, there are no safety concerns outstanding at this point in time.

REFERENCES

- (1) Consumers Power Company letter Sewell to O'Leary NRC discussing Containment Building Post Tensioning System Surveillance Report dated February 1974, letter dated April 29, 1974.
- (2) USNRC informal memorandum C Tramell to DABixel Containment Systems Containment Structural Integrity (Standard Technical Specifications) dated 11/21/74.
- (3) Bechtel Power Corporation letter from B L Lex to R M Minogue of NRC; subject, "Regulatory Guide 1.35, January 1976, Revision 2, 'In-Service Inspection of UngROUTed Tendons in Prestressed Concrete Containments' - Comments," dated May 6, 1976.
- (4) USNRC letter from M Kehnemuyi to B L Lex of Bechtel Power Corp; subject, "Your Comments on Revision 2 of Regulatory Guide 1.35, dated May 6, 1976." dated July 27, 1976.
- \*(5) USNRC letter R Purple to RYoungdahl, Issuing Amendment #14 to Provisional Operating License #DPR-20 for Palisades Plant dated 4/24/75. Includes Change #18 to Technical Specifications and Safety Evaluation Supporting Amendment #14.
- \*(6) Consumers Power Company letter DABixel to R Purple, NRC "Enclosing Containment Building Tendon Surveillance - Five-Year Surveillance Palisades Nuclear Plant dated March 1966," letter dated March 26, 1976.

\*Not enclosed.