Larry

ENGCW-EC

9 September 1968

Mr. G. W. Reinmuth
Reactor Inspector
Division of Compliance
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Reinmuth:

Inclosed is a copy of my review of the "Report on Honeycombing Turkey Point Unit 3 Containment Mat." Please let me know if I can be of further help.

My copy of the report is returned herewith.

Sincerely yours,

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as

ROBERT E. PHILLEO, Chief
Research and Development
and Standards Section
Concrete Branch, Engineering Div
Civil Works

cc: Mr. Frank Long

Comments on

"Report on Honeycombing, Turkey Point Unit 3 Containment Mat"

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The report prepared by Bechtel Associates for the Florida Power and Light Company is quite complete, particularly in the investigative phase, and generally satisfactory. However, the following comments are in order:

Investigation. The investigation by coring, chipping, and soniscope was adequate for dealing with the indicated problem. The soniscope survey in particular was thorough and helpful in assessing the condition of the mat. There is, however, one discrepancy in the interpretation of the data which tends to weaken the conclusions. In most of the cases in which a readable signal was not received, it has been demonstrated that obstructions other than accidental voids were present. Hence, the absence of a strong signal did not necessarily indicate the presence of voids. At elevation 3.0 it was concluded that many received signals were weak because, as a result of a surveying error, the signal paths passed through tendon trumpets. Those which were not through trumpets generally produced good results. However, in one sector of the mat these conclusions are in disagreement with the path locations shown in Appendix E (Drawing No. 5610 C-148). According to Figure 12 of the Whitehurst report high horizontal velocities were obtained at the 3.0 ft level in test positions 19 through 28 and position 30 in Section 4-5; and according to Figure 13 high velocities were obtained in test positions 1 through 3. Appendix E shows that all these paths pass through trumpets. Either the plotted

locations are in error or the conclusion that trumpets interrupt signals is invalid. A personal contact by telephone with Professor Whitehurst did not succeed in resolving this matter. It would be well if it could be cleared up. Otherwise, the conclusions of the Whitehurst report are consistent with Appendix E.

Although details of the structural design are not available, the mat appears to be sufficiently intact to carry the wall loads provided the concrete adjacent to the tendons has the quality and continuity assumed in design.

Proposed Remedial Measures. The grouting procedure outlined in the report should prove adequate. During the execution of the work frequent samples should be taken to check expansion of the grout since it is sensitive to field conditions.

The report is not clear as to how much of the repair will be by grouting and how much by shotcrete. Shotcrete should be applicable to a significant portion of the work.

Preventive Measures. In paragraph V-2.0 it is stated that a low slump was required to minimize shrinkage and creep effects. Actually, very little shrinkage can occur in so large a mass; and any sort of cracking resulting from volume change is unlikely with the large amount of steel which is incorporated. In most mass concrete structures emphasis is placed on the lowest possible water and cement contents for the purpose of minimizing temperature rise and the subsequent thermal stresses which accompany cooling. Such structures are normally unreinforced, and

these measures are taken to prevent cracking. None of these control measures appear important in these heavily reinforced mats. Emphasis should be placed primarily on strength and workability. If an extra inch of slump is needed for proper placement, there is no reason why it should not be used. There is also no need for two types of concrete. Apparently, some difficulty could have been prevented on Unit 3 if it had been possible to divert some of the concrete from the inside to the outside. Honeycomb should be prevented by:

a. Considering placing problems when setting steel,

b. Providing an adequate number of tremies to restrict the horizontal flow of concrete, and

c. Using a very workable concrete with a slump higher than 3 inches if necessary.

Summary.

1. A very good investigation was carried out which, except for one inconsistent group of conclusions, adequately detailed the extent of the problem.

2. The grouting repair procedure, which was developed in the manufacturer's shop is adequate.

3. In future work more emphasis should be placed on concrete workability.

Robert E. Philleo

ROBERT E. PHILLEO

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