PSNH PUBLIC SERVICE
Company of New Hampshire

SEABROOK STATION
Engineering Office:
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August 12, 1982

SBN- 307
T.F. B 7.1.2

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Frank J. Miraglia, Chief
Licensing Branch No. 3
Division of Licensing

References: (a) Construction Permit CPPR-135 and CPPR-136, Docket Nos. 50-443 and 50-444
(b) PSNH Letter, dated April 8, 1982, "Meeting Notes; Structural Engineering Branch Design Audit," J. DeVincentis to F. J. Miraglia

Subject: Submittal of Followup Documentation; Structural Engineering Branch Design Audit

Dear Sir:

We have enclosed followup documentation from the Structural Engineering Branch Design Audit which was conducted at the offices of United Engineers on March 29, 1982, through April 2, 1982.

The following "Action Item" specified in Reference (b) is included with this submittal:

- Action Item #13, dated 4/1/82

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

J. DeVincentis
Project Manager

Enclosure

B001

220.32 (3.8.3, 3.8.4, 3.8.5)

Action Item #13, dated 4/1/82

The staff presently accepts the use of ACI-349 as augmented by Regulatory Guide 1.142 in the design of Category I concrete structures other than containment. FSAR Sections 3.8.3, 3.8.4 and 3.8.5 have mentioned the use of ACI-318 Code for Concrete Structure. Evaluate and assess the impact of using ACI-349 as augmented by Regulatory Guide 1.142. Identify specific deviations from the staff position and the areas where use of ACI-318 Code results in less conservative design. Also discuss specific means for disposition of these less conservative design areas or justify their design adequacy.

RESPONSE: UE&C has made a detailed comparison of the Code Requirements of Nuclear Related Concrete Structures (ACI 349-80) with the Building Code Requirements for Reinforced Concrete (ACI 318-77) with reference to the design of PSNH Seabrook Station Units 1 and 2.

This comparison shows that the ACI-318 Code is conservative in most areas, where there are conflicting provisions between the two codes. The existing design complies with ACI 349-80 except in the following areas:

1. CHAPTER 9 - STRENGTH AND SERVICEABILITY REQUIREMENTS

   The existing design, which is based on the load combinations in the FSAR, has not considered the load R_o as given in load combinations 1, 2, and 3 of ACI 349. The design, however, has adequately accounted for this load in load combinations 9, 10, and 11 of ACI 349. The load combinations used in the design are satisfactory and are in accordance with those specified in the Standard Review Plan, Section 3.8.4.

2. CHAPTER 12 - DEVELOPMENT AND SPLICES OF REINFORCEMENT

   The provisions of ACI-349, Section 12.15.3.7 require mechanical connections (cadwelds) of reinforcing steel to be staggered at least 24 inches unless the computed stress is less than 0.5fy. There are two areas where mechanical connections have been used for structures other than the containment structure. These are the containment internal concrete structures where the majority of reinforcing bars are #14 and #18, and localized regions of other Category I buildings where cadwelds have been used for construction openings.

   Containment Internal Concrete Structures

   Approximately 50% of the internal concrete structures of the Unit 1 containment have cadweld stagger lengths between 12 and 18 inches. The remainder of the Unit 1 internal concrete structures and all of the Unit 2 internal concrete structure will conform to the stagger length requirements of ACI 349-80.

Other Category I Structures

Where construction access openings exist, cadwelds have been staggered 12 inches.

The Staff's concern is that "mechanical splices are considered to be weak links in the performance of reinforcing bars". Staggering is emphasized in areas of high stress to avoid a concentration of splices in such areas that may result in:

a. unacceptable cracking,

b. increased steel congestion that has adverse effects on concrete placement.

The existing structural design in regions where cadwelds are spaced between 12 and 18 inches is adequate and will not result in an unacceptable level of cracking under the design loading. In these regions where shear walls are the primary load resisting elements, global cracking would not be expected to be horizontal or vertical. Cracks due to shear would be inclined with the vertical axis. In any local areas where cracks would be horizontal or vertical, the 12 to 18 inch spacing, as provided in the existing design, would be sufficient to distribute the induced strain and would result in an acceptable level of cracking.

With regard to congestion and the potential for adverse effects on concrete placement, the 12 to 18 inch spacing is clearly sufficient to place quality concrete. No concrete placement problems have been identified. Hence, the existing design is adequate.

3. APPENDIX B - STEEL EMBEDMENTS

The existing design does not conform to the overly conservative provisions of Appendix B. The embedment design for Seabrook Station is consistent with accepted design practices utilized throughout the nuclear industry. The design is based on accepted formulas and/or published test data supplied by vendors.