Mr. Neil S. Carns
Senior Vice President
and Chief Nuclear Officer
Northeast Nuclear Energy Company
c/o Ms. Patricia A. Loftus
Director - Regulatory Affairs
P.O. Box 128
Waterford, CT 06385

June 16, 1997

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING EROSION OF CEMENT FROM POROUS CONCRFTE SUBFOUNDATIONS (TAC NO. M96402)

Dear Mr. Carns:

By letter dated April 30, 1997, Northeast Nuclear Energy Company (licensee) submitted additional information regarding the erosion of cement from the underlying porous concrete drainage system at Millstone Unit 3. The NRC staff has reviewed the information and seeks clarification of the information provided by the licensee's consultants in their reports.

In order to support further NRC evaluation, the licensee is requested to provide the NRC with answers to the enclosed questions. Please respond to this request for additional information expeditiously in order for the staff to complete its review in a timely manner.

Sincerely,

Original signed by:

James W. Andersen, Project Manager
Special Projects Office - Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-423

Enclosure: As stated

cc w/encl: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 16, 1997

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Waterford, CT 06385

REQUEST FOR ADDITIONAL INFORMATION

EROSION OF CEMENT FROM POROUS CONCRETE SUBFOUNDATIONS

MILLSTONE NUCLEAR POWER STATION, UNIT 3

TAC M96402

1. Construction Technology Laboratory (CTL) has performed a detailed evaluation and attempted to identify the potential causes of (i) the erosion of high alumina cement (HAC) from the upper porous concrete layer and (ii) the leaching of alkalies from the lower Portland cement porous concrete layer. However, it has neglected to consider one important aspect of erosion that is specific to the site condition. During the placement of the Portland cement concrete basemat, the HAC porous concrete and the seal coat were subjected to water accumulation and high heat of hydration (necessary conditions for high rate of conversion). Conversion of HAC is likely to have started from that point on. Neglecting this initial condition is likely to yield an erroneous estimate of the degree of conversion and reduction in the compressive strength. Explain how this aspect of the porous concrete degradation is considered in your assessment.

2. In Reference 1, CTL emphasizes a need to have representative porous concrete cores from the structure before it can provide a realistic assessment of the actual condition of the concrete (degree of conversion of high alumina concrete, effects of alkalies, reduction in compressive strength, etc.). Provide information regarding this planned activity, and results of CTL's final assessment.

3a. In the settlement analysis (Section 4 of Reference 2), GEI Consultants, Inc. (GEI) hypothesizes that all cements are lost prior to placing the static loading of the containment structure. This is a highly unrealistic initial condition. Discuss how you plan to use CTL's final assessment with GEI's techniques to obtain a realistic assessment of the settlement of the containment structure.

3b. CTL has made a rough first order estimate that the compressive strength of the HAC porous concrete will be reduced by 380 psi in the next 5 years. Explain if, and how, you accounted for this strength loss in your final assessment of the foundation behavior (e.g., in the estimate of moments and shears in the foundation basemat caused by uniform and differential settlements).

3c. Section 4.3.2 (Reference 2) states that EQE International, Inc. (EQE), determined a maximum compressive stress of about 7.4 ksf on the porous concrete layer due to vertical seismic acceleration and due to overturning. Provide the minimum compressive stress and discuss whether or not there is any loss of contact on the circumference of the basemat.

3d. Section 4.4 (Reference 2) states that total settlement of the 19-inch-thick porous concrete layer due to complete loss of cement, static loading by the containment, and seismic loading (under safe shutdown

Enclosure

earthquake) is estimated to be about 1.7 inches. Does your estimate of settlements consider the effect of saturation of the crushed stone with water? What is the estimated maximum differential settlement of the basemat due to the factors mentioned in 3b and 3c above, and what are the consequences of such differential settlement?

3e. In conjunction with the assessment of settlements that could have occurred (prior to placement of the Initial Structural Integrity Testing (ISIT) markers), and future prediction (including that under the postulated seismic event), provide a discussion of actions that you would take to ensure the integrity of the safety-related structures, systems, and components affected by the potential settlement. Such actions may include monitoring of differential settlements, identifying critical areas where differential settlements need to be monitored, etc.

4. The sketch of the Reactor Building structural model shown in Figure 3.4 (Reference 2) shows different notations for some of the structural elements from those shown in Figure 3.7B-9 of the Final Safety Analysis Report (FSAR). Explain the differences, if any, between the structural element models used in the FSAR and in the current soil-structure interaction analysis (Reference 2).

References:

1. Construction Technology Laboratory (CTL), "Investigation of Possible Deterioration of Porous Concrete, Millstone 3," April 11, 1997. Report attached to April 30, 1997, letter from M. H. Brothers, Northeast Nuclear Energy Company, to NRC.

2. GEI Consultants, Inc., "Porous Concrete Investigation, Millstone 3, March 14, 1997." Report attached to April 30, 1997, letter from M. H. Brothers, Northeast Nuclear Energy Company, to NRC.