Mr. Ted C. Feigenbaum
Executive Vice President and
Chief Nuclear Officer
Northeast Utilities Service Company
c/o Mr. Terry Harpster
Director - Nuclear Licensing Services
P.O. Box 128
Waterford, CT 06385

October 18, 1996

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON EROSION OF CEMENT FROM THE UNDERLYING POROUS CONCRETE DRAINAGE SYSTEM, MILLSTONE UNIT 3 (TAC NO. M96402)

Dear Mr. Feigenbaum:

In reviewing your letters dated July 12, August 1, and August 9, 1996, we find that we need additional information. We plan to meet with you October 31, 1996, at the Millstone Nuclear Power Station to discuss the status of the Millstone 3 concrete erosion testing program, and to gather information relative to the basemat erosion issue. Would you please plan to discuss in that meeting as much as possible of the information requested in the enclosure to this letter. Please also provide a written response providing the requested information within 30 days of the date of the meeting.

Sincerely,
Original signed by:
Vernon L. Rooney, Senior Project Manager
Northeast Utilities Project Directorate
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-423

Enclosure: Request for Additional Information

cc w/encl: See next page

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

October 18, 1996

Mr. Ted C. Feigenbaum
Executive Vice President and
Chief Nuclear Officer
Northeast Utilities Service Company
c/o Mr. Terry Harpster
Director - Nuclear Licensing Services
P.O. Box 128
Waterford, CT 06385

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON EROSION OF CEMENT FROM THE UNDERLYING POROUS CONCRETE DRAINAGE SYSTEM, MILLSTONE UNIT 3 (TAC NO. M96402)

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REQUEST FOR ADDITIONAL INFORMATION

EROSION OF CEMENT FROM THE POROUS CONCRETE DRAINAGE SYSTEM

MILLSTONE NUCLEAR POWER STATION, UNIT 3

TAC NO. M96402

References:

1. Letter B15803 (with Attachments) from Northeast Utilities (NU) to NRC, Dated July 12, 1996.
2. Letter B15825 (with Attachments) from NU to NRC, Dated August 1, 1996.
3. Letter B15850 (with Attachments) from NU to NRC, Dated August 9, 1996.

(1) Provide a complete description and findings from Phase I, Phase II, and Phase III (to the extent available) mock-up testing.

(2) Reference 3 describes the Phase III mock-up test as related to the study of interaction between the calcium aluminate concrete, and the portland cement concrete of the basemat. Provide the information regarding the relative deterioration of the two concretes by comparing the 60-day strengths of (1) portland cement mold before and after the test, and (2) that for the high alumina cement concrete. Comparisons with the specified strengths (as shown in the Conclusion) is inappropriate.

(3) The Phase III mock-up test also indicated that there was a complete lack of bond between the portland cement concrete mold (representing the basemat concrete), and the calcium aluminate concrete of the test mold. Provide information regarding the consequences of the lack of bond on the load transfer to the foundation, and on the dynamic behavior of the structure.

(4) UFSAR Section 3.8.1.6.1 states, "In general, concrete mixes were of a 28-day strength of 3,000 psi unless otherwise specified by the Engineer." However, in response to question I.1 (Ref. 1), the strength of the containment basemat concrete is indicated as 3,000 psi at 60-days. Provide information on what was really used. If available, provide information regarding the strength of lab-cured and field-cured cylinders taken from the basemat concrete during construction. This information is useful in comparing the degradation effects, if any, with the results of the mock-up tests.

(5) Provide a relationship between the grain size distribution of the sump slurry (Attachment 3, Ref. 1), and the finer particles and cement particulates in the porous concretes layers. This information is useful in understanding and predicting the ability of the erosion process to continue.

Enclosure

(6) An Operability Determination (OD) has been provided in Attachment 2 to Reference 2. In item F.1a, a gross assumption has been made that the full 800 feet of drainage pipes are filled with eroded cement. Figure II.2-3 attached to Reference 1 shows the daily count of the total amount of water collected in the sumps in the year 1994. The peak flow shown is about 6,700 gallons of water per day. Such a large flow is not feasible if the pipes were even half filled with the hardened cement. There is a vast uncertainty in estimating the yearly accumulation of dry weight of the cement residue. Based on the results of the mock-up tests and other information (e.g., the latest estimate of 1996 cement residue), provide one reasonable scenario in your OD that can be compared against the future accumulation of cement slurry in the sumps.

(7) Four additional hypothetical scenarios have been postulated in the OD (Attachment II, Ref. 2). In the evaluation of each scenario, a statement is made at the end of the evaluation, "The containment mat has sufficient rigidity to span over these hypothetical gaps without any impact on the mat qualification." The results of the calculations, if any, have not been provided. Provide the results of the calculations (stresses and deflection) for the fourth scenario (where a 5-foot diameter gap has been assumed) considering the gap to be under the heavily loaded area, for example, under the fully loaded crane wall, or reactor (primary shield) wall.

(8) Erosion of cement from the porous concrete layers is continuing, and it is necessary to monitor the movement of the foundation basemat under heavily loaded areas of the basemat (e.g., crane wall and primary shield wall). Provide information regarding your plans for monitoring the settlements under such areas.

(9) The effects of uniform and diffentential settlements could be monitored by inspecting the surface conditions of the walls near discontinuities, and pipe alignments around piping penetrations in the containment wall, crane wall, and the primary shield wall. Provide your plans to implement augmented inspections for this purpose.

cc:

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