NORTHEAST UTILITIES
THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

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December 21, 1990

Docket No. 50-336
B13692
Re: ASME Section XI

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Gentlemen:

Millstone Nuclear Power Station, Unit No. 2
Modification to Pump 5PC
Request for Relief From ASME Code Section XI Requirements

The purpose of this letter is to request relief from ASME Boiler and Pressure Vessel Code Section XI requirements pursuant to 10CFR50.55a(g)(6)(i). Northeast Nuclear Energy Company (NNECO) has effected a repair to a through-wall leak in the body of Service Water Pump 5PC on the 'B' service water train. This repair is an alternative to the requirements of Section XI IWA-4000 and IWA-7000.

Background

During routine maintenance of the "C" service water pump it was discovered that a portion of the discharge elbow showed evidence of corrosion. Excavation of the affected area resulted in an irregular cavity on the inside wall of 9.5 inches by 4 inches, with depths ranging from .15 to .32 inches. The nominal wall thickness of the elbow is 1.0 inches. In addition, an area of deterioration was identified at the same location on the external surface. This area showed signs of weepage and has a through-wall leak. Excavation of this area resulted in a cavity approximately 3 inches by 2 inches, with a maximum depth of .375 inches. Wall measurements taken in the area of the through-wall leak indicated that .1875 inches remain. Also, there was a crack visible on the outside diameter and inside diameter of the casting, corresponding with the area of the through-wall leak. The base material of the discharge elbow is ASME SA 351 Gr. CF3M (316 series stainless steel).

In general, the stainless steel casting inside surface exhibits small areas of corrosion pitting. These are areas which exhibit high delta ferrite which was preferentially attacked by microbiological-induced corrosion.

The cracking observed has been evaluated as casting shrinkage. In addition, an internal chill bar (hexagonal shaped) was identified during an informational radiographic examination. It appears that the chill bar was not properly consumed during the casting process. During excavation of the

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corroded area, the lack of fusion associated with the internal chill bar was chased and the crack exposed.

Code Relief Requested

A one-time relief is requested from performing a repair in accordance with the requirements of ASME Boiler and Pressure Vessel Code Section XI, Subsection IWA-4000. In lieu of those requirements, the following alternate repair was performed:

1. The visual cracks on the external (outer) surface were peened in a manner that closed the cracks (i.e., smear metal over cracks).

2. A weld overlay using approved procedures was performed. The overlay area encompasses the shrinkage and the chill bar area (approximately 12 inches by 12 inches). The overlay thickness is 3/8 inch. When one layer was completed, a liquid penetrant examination was performed on the weld overlay surface to ensure that the crack had not propagated. In addition, a liquid penetrant exam was performed on the surface of the final pass.

3. A radiographic exam of the area adjacent to the weld overlay was performed and a comparison made with respect to the original exam (to determine any increased cracking associated with the weld overlay process).

4. An ultrasonic examination of the weld overlay was performed. This examination was used to assess the structural integrity of the overlay and provide a baseline for future inspections.

Basis for Relief

Based on ASME III Subsection ND-3441.10 requirements, the minimum wall thickness required is .0926 inches for pressure retention. Thus, a substantial margin exists in the area which was excavated. The through-wall leak and the entire area which was excavated were repaired utilizing weld overlay to a thick s of .375 inches on the outside diameter of the elbow. The inside diameter of the elbow was coated with Belzona to arrest the corrosion mechanism. It should be noted that the original code of construction was ANSI B31.1, and the requirements of ASME III Subsection ND meet or exceed that criteria.

The resultant condition is considered to be technically acceptable based on the following:

1. The minimum wall requirements for all areas of the discharge elbow, including the weld repair section, are in excess of the code minimum.

2. The area of weld overlay is 12 inches by 12 inches, which provides structural reinforcement in the affected area.

3. The excavated area is considered localized, and the maximum seismic stress for the discharge elbow for the SSE conditions is 790 psi compared to an allowable of 14,000 psi. (REF B&W Calculation 713-6964-97, July 19, 1974).(1)

4. The use of the Belzona coating as a corrosion inhibitor provides ample deterrent for further base metal corrosion. In addition, all voids have been filled with this material and machined flush to the contour of the elbow to limit the potential for localized erosion in the area of the excavation.

5. The nondestructive examinations performed ensure the structural integrity of the weld overlay by itself, and also ensure that the surrounding base metal has not been adversely affected by the welding process.

   Liquid penetrant examinations were performed on the first and final layers of the weld overlay. The first layer liquid penetrant examination identified if any casting shrinkage defects extended into the overlay. The liquid penetrant examinations covered the weld overlay and the adjacent base metal heat-affected zone. This examination is consistent with fabrication code requirements.

   The informational radiographic examinations performed (prior to and after weld overlay repair) ensured that the weld overlay process did not adversely affect the underlying and adjacent cast elbow.

   The ultrasonic examination of the weld overlay ensured the structural integrity of the overlay by itself and provided a baseline for future inspections to ensure the underlying casting shrinkage does not propagate through the overlay. The weld overlay will be reexamined periodically during scheduled refueling outages.

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(1) The original casting was composed of ASTM A-48 Class 40 (cast iron) and was later changed to the existing ASME SA 351 Gr. CF3M (Type 316) stainless steel material. However, the calculation was not revised to reflect this change. The allowable stress used in the calculation of record is 4000 psi and does not take into consideration any increase for Level "C" service limits as allowed by original design criteria. The allowable stress levels indicated above for the stainless steel casting are consistent with the original calculation and have not been adjusted for level "C" service limits.

Based on the above, the repair of the "C" service water pump in this manner is considered acceptable for all design basis conditions. This condition shall be monitored through routine surveillance and any deterioration reported.

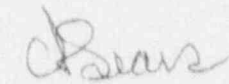
Relief from ASME Section XI is requested as soon as practical to allow the pump to be declared operable and returned to its normal operational lineup.

If you have any questions, please contact us.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

FOR: E. J. Mroczka
Senior Vice President

BY: 

C. F. Sears
Vice President

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W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3