



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

SAFETY EVALUATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

MILLSTONE STATION UNIT 1

ISOLATION CONDENSER STEAM LINE WATER HAMMER
AND PIPE ANCHOR SAFETY FACTOR

DOCKET NO. 50-245

1.0 BACKGROUND

On December 19, 1979, a water hammer incident in the isolation condenser system piping resulted in minor concrete damage at containment penetration anchor X-10A. Also, some expansion anchor bolts at other supports of the isolation condenser piping system were pulled slightly out of the concrete by the water hammer loads.

In response to a letter from the Director of the Office of IE-Region I, Northeast Nuclear Energy Company, the licensee, by letter dated February 26, 1981, provided information regarding the water hammer events in the steam line between the reactor vessel and the isolation condenser and the subsequent damage assessments, evaluations and repairs. We have reviewed the licensee's response and the following is our evaluation.

2.0 EVALUATION

The fluid forces due to water hammer in the isolation condenser supply and return line were developed by the licensee. The pipe stresses and support/anchor reactions were computed from the water-hammer fluid loads using the ADLPIPE computer code. In order to maintain the piping stresses for water-hammer loadings within the acceptable limits outlined in the Millstone Nuclear Power Station Unit 1 FSAR, Section 12.0, "Structural Design", some additional pipe restraints were required. The licensee committed to complete the required design and installation of these additional restraints prior to resuming plant operation following the refueling outage. In addition, the licensee redesigned and repaired the containment penetration anchor X-10A at elevation 80'-9".

The isolation condenser piping, pipe restraints and containment penetration anchor X-10A were all redesigned for the following loading conditions:

1. Normal Operating Loads + DBE
2. Normal Operating Loads + HEPB
3. Normal Operating Loads + Water Hammer

where Normal Operating Loads = PRESSURE + DEAD WEIGHT + THERMAL

HEPB = High Energy Pipe Break Load of the steam supply line to the isolation condenser at the specified location postulated in the licensee's analysis.

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3.0 CONCLUSION

Based on the information provided by the licensee, there is reasonable assurance that the isolation condenser supply line for Millstone Station Unit 1 as redesigned will withstand the effect of water-hammer loads. However, our review indicates that two design areas do not comply with NRC I&E Bulletin 79-02 which requires a factor of safety of at least four for expansion anchor bolts under all design conditions. A factor of two instead of four was reported for load condition 2 above. In addition, to comply with the design condition requirements of I&E Bulletin 79-02, load condition 2 above should be: Normal Operating Loads + HEPB + DBE.

Date: Jun 3, 1981