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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January 22, 1988

Docket No. 50-423
B12799

Re: 10CFR50.59

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Millstone Nuclear Power Station, Unit No. 3
Reactor Coolant Pumps - Loose Parts

During the core unload at Millstone Unit No. 3, seven loose parts were found and later retrieved from the lower portion of the reactor vessel. Based on an on-site evaluation by Westinghouse and Northeast Nuclear Energy Company (NNECO) personnel in November, 1987, these loose parts were identified as reactor coolant pump (RCP) locking cups for the turning vane/diffuser bolts. NNECO subsequently decided to extend the Millstone Unit No. 3 refueling outage to inspect and repair the RCPs. During a conference call between the NRC Staff and NNECO representatives on November 25, 1987, NNECO informed the Staff that NNECO will be providing the Staff a report on our efforts to search for, and retrieve loose parts from the RCP and corrective actions taken to repair the RCPs. Accordingly, NNECO hereby provides a report (Attachment 1) which summarizes the corrective actions NNECO has taken to repair the RCPs.

If you have any questions, please contact my staff directly.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

E. J. Mroczka

E. J. Mroczka
Senior Vice President

By: C. F. Sears
Vice President

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cc: W. T. Russell, Region I Administrator
R. L. Ferguson, NRC Project Manager, Millstone Unit No. 3
W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3

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Attachment 1

Millstone Unit No. 3
Report on
the Reactor Coolant Pump Loose Parts Evaluation

January 1988

Millstone Unit No. 3

Report on the Reactor Coolant Pump Loose Parts Evaluation

Introduction

During the core unload at Millstone Unit No. 3, seven loose parts were found and later retrieved from the lower portion of the reactor vessel. Based on an on-site evaluation by Westinghouse and NNECO personnel in November, 1987, these loose parts were identified as reactor coolant pump (RCP) locking cups for the turning vane/diffuser bolts. NNECO subsequently decided to extend the Millstone Unit No. 3 refueling outage to inspect and repair the RCPs.

Sequence of Events

On November 17, 1987, during the core unload at Millstone Unit No. 3, a foreign object was discovered laying on the bottom core plate. The object was determined to be cylindrical in shape, about 2 inches in length, and was videotaped using an underwater camera. The videotape was reviewed by on-site NNECO and Westinghouse personnel to attempt to determine the origin of the object. On November 18, 1987 the object was removed from the core and placed in a temporary storage location in the refueling cavity. On November 19, 1987 six additional cylindrical objects were found laying on the bottom core support plate. At this time it was decided to totally off-load the core, and do a total inspection both above and below the lower core support plate. By November 23, 1987 all of the seven objects had been retrieved from the reactor vessel and a complete inspection of the area above and below the lower core support plate had been accomplished. A small (dime size) piece of metal was found laying on the lower core support plate which was later retrieved from the vessel. No other foreign material and no damage to any structural component was observed.

During this time an investigation was performed to identify the source of the objects. This investigation included a review by NNECO and Westinghouse personnel of the photographs and videotapes of the objects. Areas that received special attention were the reactor vessel internals package, reactor coolant piping thermal sleeves, stigma refueling machine parts, containment polar crane and reactor coolant pump internals. On November 23, 1987 it was determined the parts were the locking cups for the bolts that hold the reactor coolant pump turning vane and diffuser assembly to the thermal barrier support flange. On November 24, 1987, Westinghouse confirmed the identification of the parts as the locking cups. A diagram of the locking cup design is

shown in Figure 1. During the November 25, 1987 conference call between NNECO and the NRC, NNECO discussed many of the issues that needed to be resolved to determine if and when the locking cups would be repaired.

Evaluation

An investigation was undertaken to determine the effects if the locking cups became loose and migrated to the core. Also evaluations were performed to determine the effects of the bolts coming loose and potentially impacting reactor coolant system components. Sensitivity studies were undertaken to determine what effects any or all of the remaining 85 locking cups would have on core thermal hydraulic performance, both during normal operating conditions and during transient or accident conditions. During this review it was also determined that Millstone Unit No. 3 was the only Westinghouse plant that had this style of locking cups. Subsequent pumps were manufactured with a split cup as shown in Figure 2. A meeting was held with NU management on December 4, 1987 to discuss the results of the assessment from NNECO Engineering and Westinghouse. Preliminary analyses had shown that the adverse effects of loose locking cups in the core were within the bounds of the safety analysis and plant operation could be justified. The review of the location of the seven locking cups and the previous cycle's core maps showed no detrimental effects from the seven cups that were found in the core. NNECO also reviewed the potential effects of a loose bolt on the RCP and reactor coolant system (RCS) instrumentation. The effect of bolt impact on the RCS temperature instrumentation was unacceptable to NNECO since a direct impact could degrade the RCS pressure boundary. There were also concerns that additional risks could be incurred due to a forced mid-cycle outage or lengthened second refueling outage. Based on the evaluation, the decision was made to repair the pumps during the present refueling outage.

Corrective Actions

A design change was developed that modifies the locking cup arrangement. Two different types of repair locking clips were designed for the pumps. The first, for those bolts where the locking cups were still in place, was a 180 degree clip with a tab attached. This tab fits into the allen head insert in the bolt head preventing the locking cup from falling out of the counterbore. The second, for those bolts where the locking cups were missing, has a piece of barstock welded to the tab. This barstock fits into the allen head insert and provides the positive anti-rotation force normally provided by the locking cup. These two clips are shown in Figures 3 and 4. In addition, all bolts with missing locking cups were checked and retorqued as necessary to the original design requirement.

The installation of alternate locking fixtures started on December 24, 1987 and was completed on January 4, 1988. The results of the repair are:

1. Reactor Coolant Pump A: No missing locking cups but two cups were loose.

2. Reactor Coolant Pump B: Four missing locking cups.

3. Reactor Coolant Pump C: No missing locking cups.

4. Reactor Coolant Pumps D: Three missing locking cups with two additional cups loose.

Loose Parts Monitoring System

An upgrade to the existing loose parts monitoring system (LPMS) was planned for the second refueling outage. In light of the RCP loose parts, a decision was made to accelerate this planned improvement of the LPMS. It is anticipated that the upgraded LPMS will be installed during Cycle 2. However, NNECO has not made a practice of routinely entering Technical Specification action statements voluntarily to perform plant modifications or non-essential maintenance. Specifically, it is NNECO's intention not to enter the Technical Specification 3.3.3.8 (Applicable Modes 1 and 2) action statement voluntarily to make plant modifications to upgrade the existing LPMS. This modification will be accomplished during Modes 3 and below or during an outage of sufficient duration during Cycle 2.

Conclusions

Extensive search and retrieval operations have been performed at Millstone Unit No. 3 to retrieve the reactor coolant pump loose parts (i.e. locking cups). In addition, corrective actions have been taken to repair the RCPs to prevent recurrence. Therefore, it is concluded that Millstone Unit No. 3 can be operated safely for Cycle 2 with the RCPs restored to original design requirements.

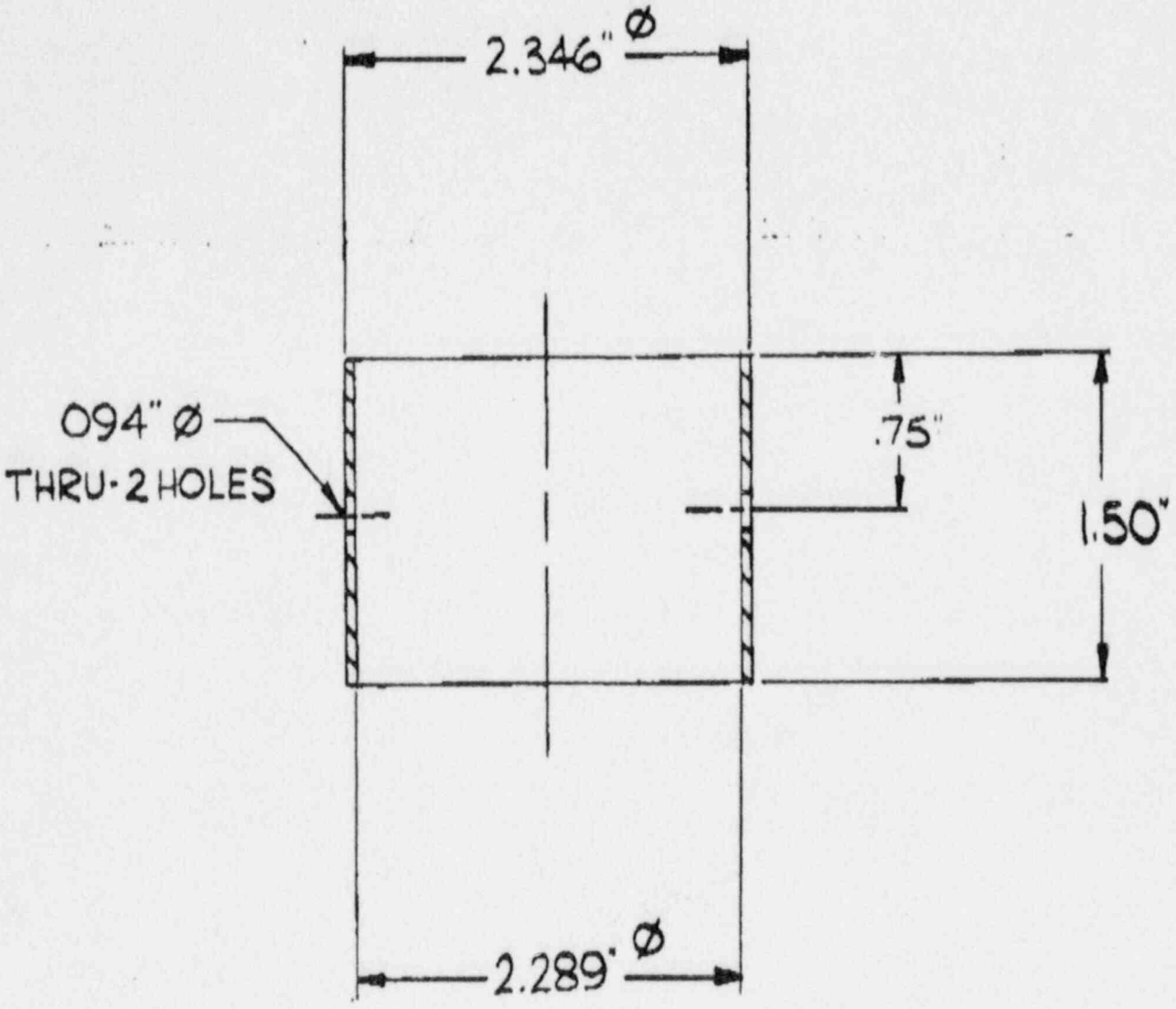
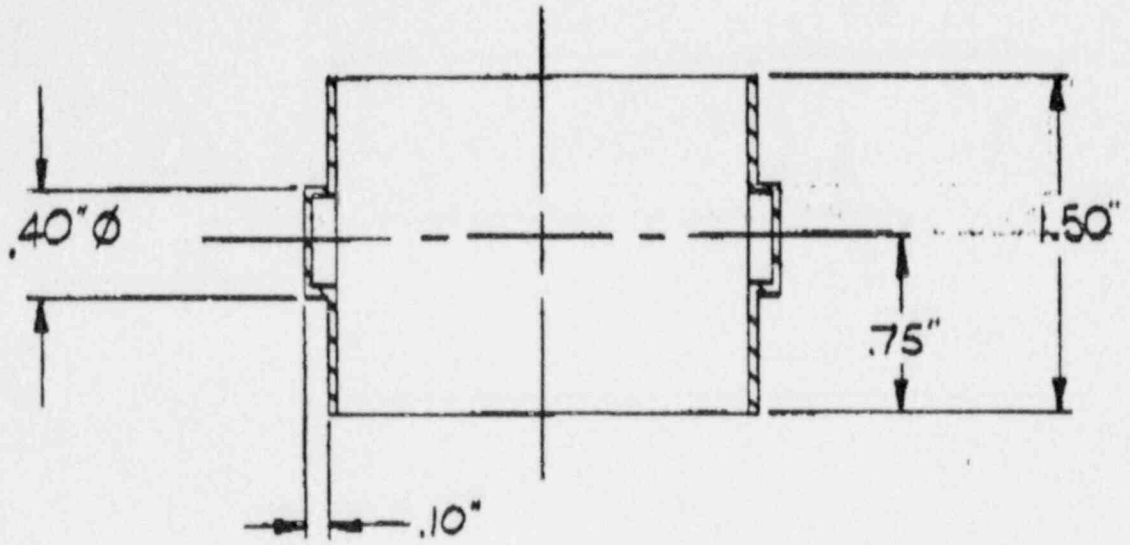


FIGURE 1
LOCKING CUP



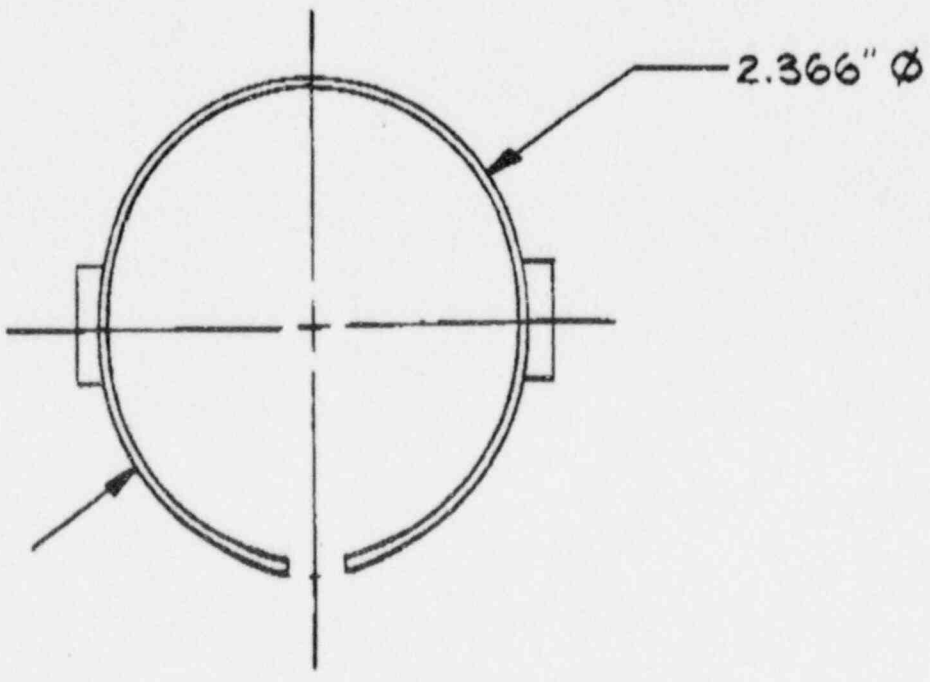


FIGURE 2

LOCK CUP

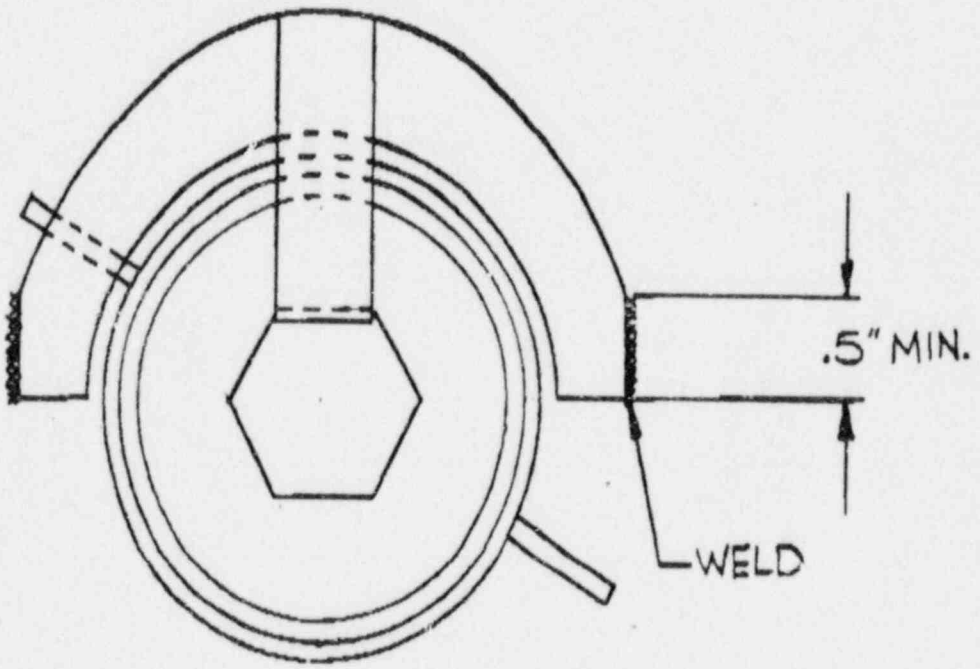


FIGURE 3

MECHANICAL TAB & PLUG LOCATION

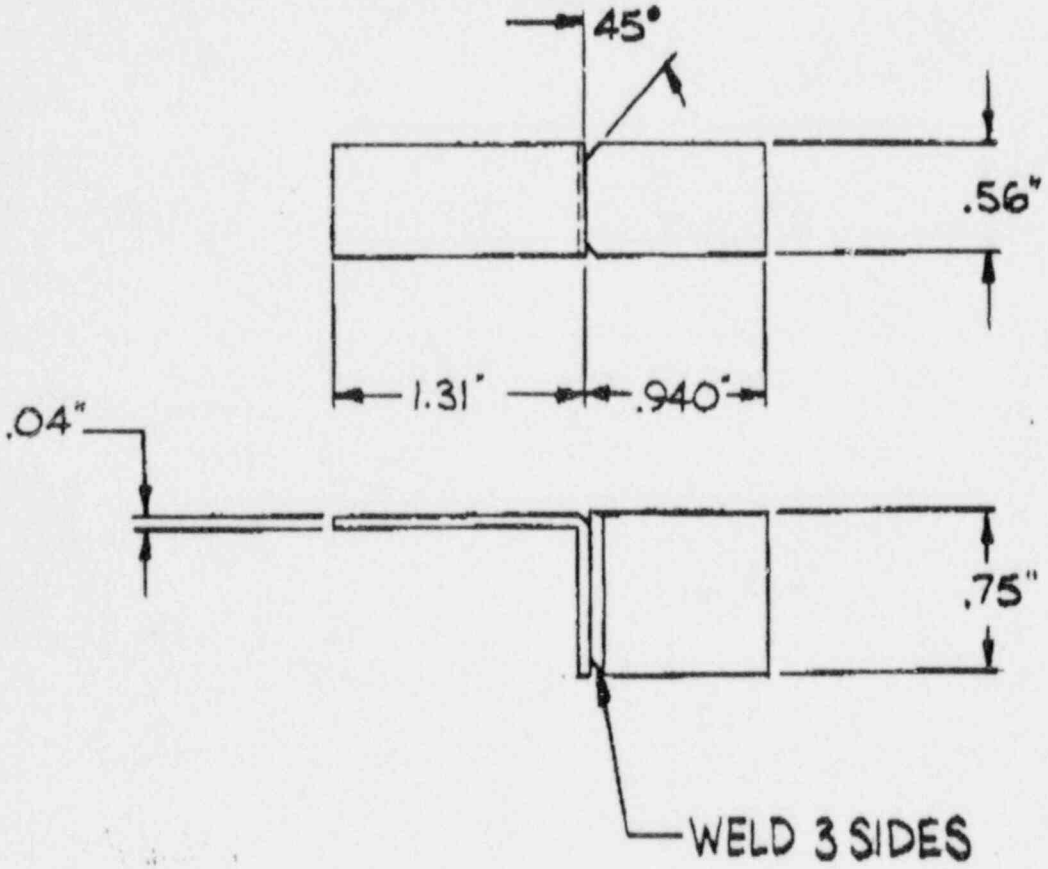


FIGURE 4

RETAINER TAB & PLUG