

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Pilgrim Nuclear Power Station DOCKET NUMBER (2) 0 5 0 0 0 2 9 3 1 OF 0 5

TITLE (4) Crack in the Yoke Portion of a Residual Heat Removal System Valve

EVENT DATE (5) 06/08/88 LER NUMBER (6) 017-00 REPORT DATE (7) 07/08/88 OTHER FACILITIES INVOLVED (8) N/A

OPERATING MODE (9) N POWER LEVEL (10) 000 THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more of the following) (11) 20.402(b) 20.405(a)(1)(i) 20.405(a)(1)(ii) 20.405(a)(1)(iii) 20.405(a)(1)(iv) 20.405(a)(1)(v) 20.405(e) 50.38(c)(1) 50.38(c)(2) 50.73(a)(2)(i) 50.73(a)(2)(ii) 50.73(a)(2)(iii) 50.73(a)(2)(iv) 50.73(r)(2)(v) 50.73(a)(2)(vii) 50.73(a)(2)(viii)(A) 50.73(a)(2)(viii)(B) 50.73(a)(2)(ix) 73.71(b) 73.71(c) OTHER (Specify in Abstract below and in Text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12) NAME Douglas W. Ellis - Compliance Division Engineer TELEPHONE NUMBER 617 747-8160

Table with 11 columns: CAUSE, SYSTEM, COMPONENT, MANUFACTURER, REPORTABLE TO NPROS, CAUSE, SYSTEM, COMPONENT, MANUFACTURER, REPORTABLE TO NPROS. Row 1: X, B, O, I, N, V, W, O, 3, O, Y

SUPPLEMENTAL REPORT EXPECTED (14) YES (If yes, complete EXPECTED SUBMISSION DATE) NO EXPECTED SUBMISSION DATE (15) 08/15/88

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

On June 8, 1988 at approximately 0115 hours, a crack was discovered in the yoke portion of a Residual Heat Removal System (RHRS) Loop 'B' valve. The crack did not involve a failure of the pressure boundary of the valve MO-1001-28B. At the time of discovery the 'B' Loop of the RHRS was in the shutdown cooling (SDC) mode, and was secured from service after the discovery. The 'A' Loop was placed in the SDC mode on June 8, 1988 at 0510 hours.

The cause for the crack has not been positively determined but is being investigated by a multi-disciplinary team. Based on the completion of the investigation, an update will be submitted. The valve is an 18 inch pressure seal globe type valve and was manufactured by the Walworth Company.

Corrective actions taken and planned include the following. Removal of the valve yoke and metallurgical examination. Disassembly and inspection of valve internals, stem, and motor operator. Repair or replacement of the valve yoke. Review of the operating history of the valve and similar Loop 'A' valve. Examination of the similar Loop 'A' valve yoke.

This condition was discovered during an extended outage while in cold shutdown. The reactor mode selector switch was in the SHUTDOWN position. The control rods were in the inserted position. The Reactor Vessel (RV) water temperature was 95 degrees Fahrenheit with negligible decay heat. The RV pressure was zero psig. The reactor power level was zero megawatts-thermal. Both loops of the Core Spray System were operable. This condition posed no threat to the health and safety of the public.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

EVENT DESCRIPTION

On June 8, 1988 at approximately 0115 hours, a crack was discovered in the motor operator end portion of the yoke of the Residual Heat Removal System (RHRS) Loop 'B' valve MO-1001-28B.

At the time of discovery the RHRS 'B' Loop was in the Shutdown Cooling (SDC) mode with pump 'B' in service. The 'A' Loop was not in operation but was available. The Loop 'A' valve MO-1001-28A was in the open position and the downstream, in-series valve MO-1001-29A was in the closed position.

Initial indication was a flowrate in RHRS/SDC Loop 'B' that was not consistent with an indicated (closed) position for the -28B valve. Licensed utility operator observation of the indicated flowrate and indicated valve position led to a visual inspection of the valve by a licensed utility operator and subsequent Control Room notification.

Initial licensed utility operator action consisted of the following. The 'B' Loop of the RHRS was secured from the SDC mode of operation. The -28B valve was left in the as-found position (i.e., throttled). The control switch of the 'B' pump (P-203B) was moved to the off position. The downstream and in-series -29B valve was closed. The control switches for both Loop 'B' pumps were tagged. The breakers to the motors of the Loop 'B' pumps were opened.

The -28B valve is an 18 inch pressure seal globe type valve and was manufactured by the Walworth Company. The -28B valve is located in a vertical section of piping. The yoke and motor operator is in the horizontal plane.

The motor operator (Limiterque type SMB-5) is bolted to, and supported by, the valve yoke. The yoke is fabricated with a casting and welded steel plate. The welded plate is approximately 21 inches in diameter and two and one-half inches thick. At the weld, the yoke is approximately 10 inches in diameter and one inch in wall thickness.

The crack appeared asymmetrical and continuous (i.e., 270 degrees) in the weld and plate. The crack extended approximately from the nine o'clock position clockwise to the six o'clock position.

Essentially, the orientation, size and type of the RHRS Loop 'A' valve -28A and motor operator is identical to the -28B valve. A visual inspection performed on June 8, 1988 at 0850 hours revealed two indications in the area of the -28A valve yoke and plate. One indication, located within the weld at the 12 o'clock position, was subsequently identified as a surface irregularity after the paint was removed.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

The other indication was located on the cast portion of the -28A valve yoke approximately one and one-half inches from the plate. The indication was not located within the weld. The paint around the area of the indication has not yet been removed (when this report was prepared) because of the possibility of adversely effecting a planned examination of the indication.

This condition was discovered during an extended outage while in cold shutdown. The reactor mode selector switch was in the SHUTDOWN position. The control rods were in the inserted position. The Reactor Vessel (RV) water temperature was approximately 95 degrees Fahrenheit with negligible core decay heat. The RV pressure was zero psig. The reactor power level was zero megawatts-thermal. Both loops of the Core Spray System were operable.

CAUSE

The cause for the inconsistency in the Loop 'B' RHRS/SDC flowrate and indicated closed position of the -28B valve is believed to be the crack in the valve yoke that prevented the valve disc from achieving the fully closed position.

The cause(s) for the crack in the yoke portion of the -28B valve and the indication in the cast portion of the -28A valve yoke have not yet been positively determined but are being investigated by a multi-disciplinary team. Based on the completion of the investigation, an update report will be submitted.

CORRECTIVE ACTION

Failure and Malfunction Report 88-121 was written to document the crack in the yoke portion of the -28B valve. Maintenance Request 88-10-86 was issued.

On June 8, 1988 at 0510 hours, the 'A' Loop of the RHRS was placed in the SDC mode of operation after the Loop 'A' valves MO-1001-28A and -29A were visually inspected by a licensed utility operator.

Additional visual inspections of the -28B valve were performed prior to the daily staff meeting. Following staff discussions of the -28B valve at the meeting, an additional visual inspection of the -28A valve was made on June 8, 1988 at 0850 hours. Failure and Malfunction Report 88-122 was written to document the indications discovered in the yoke portion of the -28A valve. Maintenance Request 88-10-87 was issued.

A multi-disciplinary Task Force (i.e., team) was formed on June 8, 1988.

The onsite NRC Resident Inspector was verbally notified on June 8, 1988 at approximately 1000 hours. An information call was made to the NRC Operations Center on June 10, 1988 due to considerable interest in the regional printed news media.

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TEXT (if more space is required, use additional NRC Form 366A's) (17)

Nonconformance Reports (NCR) 88-39 and 88-40 were written to document Quality Control visual inspections of the -28A and -28B valves, respectively.

When this report was prepared the following actions have been taken or planned. A review was performed of operating records from January 1986 to the time of discovery of the crack. The -28B valve operator and yoke were removed from the valve. The cracked portion of the plate was sent to a laboratory for metallurgical examination. The valve stem, valve disc and seat were visually inspected and found to be in satisfactory condition. The valve disc, previously planned for future replacement, will be replaced while the valve is disassembled. The motor operator internals will be inspected. The yoke of the similar Loop 'A' valve -28A will be examined.

SAFETY CONSEQUENCES

This condition posed no threat to the health and safety of the public.

The RHRS is designed for four principle modes of operation: Shutdown Cooling (SDC), Low Pressure Coolant Injection (LPCI), Suppression Pool Cooling, and Containment Spray. The crack in the yoke portion of the RHRS Loop 'B' valve -28B affected the closing and throttling functions of the valve but did not affect the pressure boundary of the valve. The valve is located in a section of piping that is common to the SDC and LPCI modes of RHRS operation.

In the SDC mode, the RHRS functions to remove heat from the RV during shutdown conditions when the RV pressure is less than 110 psig. This is accomplished by the removal of water from the RV and heat transfer during the flow of this water through one or both of the two RHRS heat exchangers. One heat exchanger is located in each of the two RHRS Loops. The RHRS Loops are connected downstream of the heat exchangers and upstream of the -28A and -28B valves.

- ° Assuming the RHRS/SDC Loop 'A' (or 'B') return flow path was not available, the SDC flow of water from one or both of the RHRS heat exchangers would be returned to the Reactor Vessel via the RHRS/SDC Loop 'B' (or 'A').
- ° Assuming the RHRS/SDC Loops 'A' and 'B' return flow paths were not available, alternate heat removal methods available include:
  - ° Heat transfer using the Reactor Water Cleanup (RWCU) System heat exchangers.
  - or-
  - ° A feed and letdown process using condensate for feed and letdown via the RWCU System.
  - or-
  - ° The Core Spray System

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The RHRS/LPCI mode, in conjunction with the other systems of the Core Standby Cooling Systems (CSCS), provides water to the Reactor Vessel if necessary. The other systems of the CSCS are the High Pressure Coolant Injection System, Automatic Depressurization System, and the Core Spray System (CSS). The CSS and RHRS/LPCI mode are independent and diverse systems that function to achieve the same objective. The same signals automatically initiate the start of the CSS and RHRS/LPCI mode.

The Loop 'A' valves (MO-1001-29A and check valve 1001-68A) and Loop 'B' valves (MO-1001-29B and check valve 1001-68B) are located downstream and in-series with the -28A and -28B valves, respectively. Further, the in-series valves -29A (-29B) and -68A (-68B) are located outside and inside of the primary containment (i.e., Drywell), respectively. Therefore, the pressure boundary of the primary containment would not be affected.

The -28B valve and RHRS Loop 'B' were made inoperable by the crack in the yoke portion of the -28B valve. If this condition had been discovered with the mode selector switch in the STARTUP or RUN position, a limiting condition for operation would have been entered.

Operator actions for the RHRS/SDC mode of operation or response to automatic actuation of the RHRS/LPCI mode are addressed in written procedures. The procedures include: 2.2.86, "Residual Heat Removal"; 2.4.25, "Loss of Shutdown Cooling"; and 2.2.19, "Low Pressure Coolant Injection System".

This report is being submitted pursuant to 10 CFR Part 50.73 (a)(2)(vii) because the RHRS/SDC mode is designed to remove residual heat and because the RHRS/LPCI mode, in conjunction with other systems of the CSCS, is designed to mitigate the consequences of an accident. The 'B' Loop of RHRS was made inoperable due to the crack in the yoke portion of the -28B valve. The 'A' Loop RHRS valve -28A was declared inoperable in accordance with the Quality Assurance Program when NCR 88-39 was issued. It should be noted that the RHRS Loop 'A' (including valve -28A) was performing its function prior to and at the time the NCR was written and both loops of the Core Spray System were operable.

SIMILARITY TO PREVIOUS EVENTS

A review of Pilgrim Station Licensee Event Reports will be conducted for similarity at the completion of the ongoing investigation for cause.

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this report are as follows:

SYSTEMS

Residual Heat Removal System (RHRS/LPCI) BO

COMPONENTS

Valve, Injection (MO-1001-28B) INV



**BOSTON EDISON**

Pilgrim Nuclear Power Station  
Rocky Hill Road  
Plymouth, Massachusetts 02360

**Ralph G. Bird**  
Senior Vice President — Nuclear

JULY 8, 1988  
BECO Ltr. #88-107

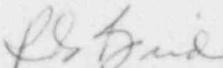
U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Docket No. 50-293  
License No. DPR-35

Dear Sir:

The attached Licensee Event Report (LER) 88-017-00 "Crack in the Yoke Portion of a Residual Heat Removal System Valve" is submitted in accordance with 10 CFR Part 50.73.

Please do not hesitate to contact me if you have any questions regarding this report.

  
R.G. Bird

DWE/b1

Enclosure: LER 88-017-00

cc: Mr. William Russell  
Regional Administrator, Region I  
U.S. Nuclear Regulatory Commission  
475 Allendale Rd.  
King of Prussia, PA 19406

Sr. Resident Inspector - Pilgrim Station

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