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IN 86-40



UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

June 5, 1986

IE INFORMATION NOTICE NO. 86-40: DEGRADED ABILITY TO ISOLATE THE REACTOR COOLANT SYSTEM FROM LOW-PRESSURE COOLANT SYSTEMS IN BWRS

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or a construction permit (CP).

Purpose:

This notice is provided as a supplement to Information Notice (IN) 84-74 on interfacing systems loss-of-coolant accidents (LOCA) in boiling water reactors (BWRs) which would bypass primary containment. Two recent events are described where the high-pressure reactor coolant system could not be fully isolated from low-pressure piping systems outside of primary containment.

It is expected that recipients will review the information for applicability to their facilities and consider actions, if appropriate, to preclude similar problems from occurring at their facilities. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

Pilgrim

On February 13, 1986, Pilgrim experienced a "design pressure" alarm on the B loop of the residual heat removal (RHR) system because of leakage through a check valve (1001-68B) and a motor-operated isolation valve (1001-28B, the outboard, normally closed, isolation valve) in the line (see Figure 1). The RHR system has a design pressure of 450 psig compared with a 1250 psig design pressure of the reactor coolant system. In addition to design pressure alarms, the piping up to the 28B valve had become warm. Several design pressure alarms had occurred during the preceding several weeks. The licensee's prior corrective action had been to vent the lines. On February 13, the licensee closed the normally open 1001-29B valve and opened the 28B valve to isolate the system. The licensee planned to operate in this configuration until a scheduled refueling and maintenance outage in September 1986.

Copies to: Withers, Yundt, Lentsch, Orser, Steele, E. Burton, E. Jordan, A. Holm, LIS, C. A. Olmstead, S. Hoag, S. Sautter, TNP:GOV REL F:NRC CHRONO, TNP:GOV REL F:NRC IE Information Notice 86-40

PGE OAR Action - M. H. Malmros (Due 9/12/86)
NSRD Action - M. H. Malmros

On April 11 and 12, 1986, the closed 29B valve began leaking. Several high pressure alarms were reported. The licensee bled off the line to reduce pressure and began an orderly shutdown, but within a short period of time, the high pressure alarm was again received. The 28B valve was closed, but the leakage problem continued. The shutdown rate was then increased until the unit scrammed because of other problems. An NRC augmented inspection team was dispatched to the site to investigate these RHR valve problems and two problems in other systems.

Duane Arnold

On March 15, 1986, while reducing power for an outage, Duane Arnold reported closing the outboard LPCI (low-pressure coolant injection mode of RHR) isolation valve MO-2004 due to leakage through the inboard isolation valve MO-2003 (see Figure 2).

Because the leakage flow was relatively small, the $\Delta p$ across the check valve inside of containment (CV-2002) was not high enough to seat the check valve. The problem was discovered when it was noted that the pressure controllers on the RHR heat exchangers were indicating a pressure of 450 psig rather than the normal 70 psig. RHR system relief valves had lifted to keep pressure at or below 450 psig. Closing the MO-2004 valve stopped the leakage, but because the plant has loop selection logic, both loops of LPCI were rendered inoperable. The plant continued its planned shutdown and reached cold shutdown on March 16. The leaking valves were repaired during the outage.

Discussion:

The underlying cause of this problem is leaking valves, one of which is inaccessible with the plant at power. Possible solutions include increased surveillance, preventive maintenance, and reliability-based replacement. Other BWR systems that can be subject to similar problems include but are not limited to core spray, high pressure coolant injection system (see IE Information Notice 84-74), and reactor core isolation cooling.

It is possible for leakage to exist from the reactor coolant system to a low pressure system without causing a high pressure alarm or lifting of safety valves in the low pressure system. For example, for the preceding events, if the check valve at the discharge of one of the RHR pumps is leaking, the reactor coolant will flow to the suppression pool. Hence, slowly increasing level in the suppression pool is one indication that there is leakage from the reactor coolant system to the low pressure RHR system, and degradation of the reactor coolant pressure boundary. If leakage through the degraded valves were to increase suddenly, a severe accident could result, as described in the following paragraph. Further, it should be noted that such leakage does not meet the intent of general design criteria 14, 30, and 54 of Appendix A to 10 CFR Part 50.

The leaking of primary coolant into RHR lines that were never meant to contain fluid at that temperature and pressure can cause a number of incidents: over-pressurization with possible faulting of the low pressure line and a LOCA, steam binding of one or more of the RHR pumps, and waterhammer. The safety significance of these events is the increased probability of core melt and releases in excess of 10 CFR 100 limits. The Office of Nuclear Reactor Regulations has designated this topic Generic Issue number 105, "Interfacing Systems LOCA at Boiling Water Reactors," and has given it a "high" priority. A generic letter concerning staff actions relating to this topic is being considered.

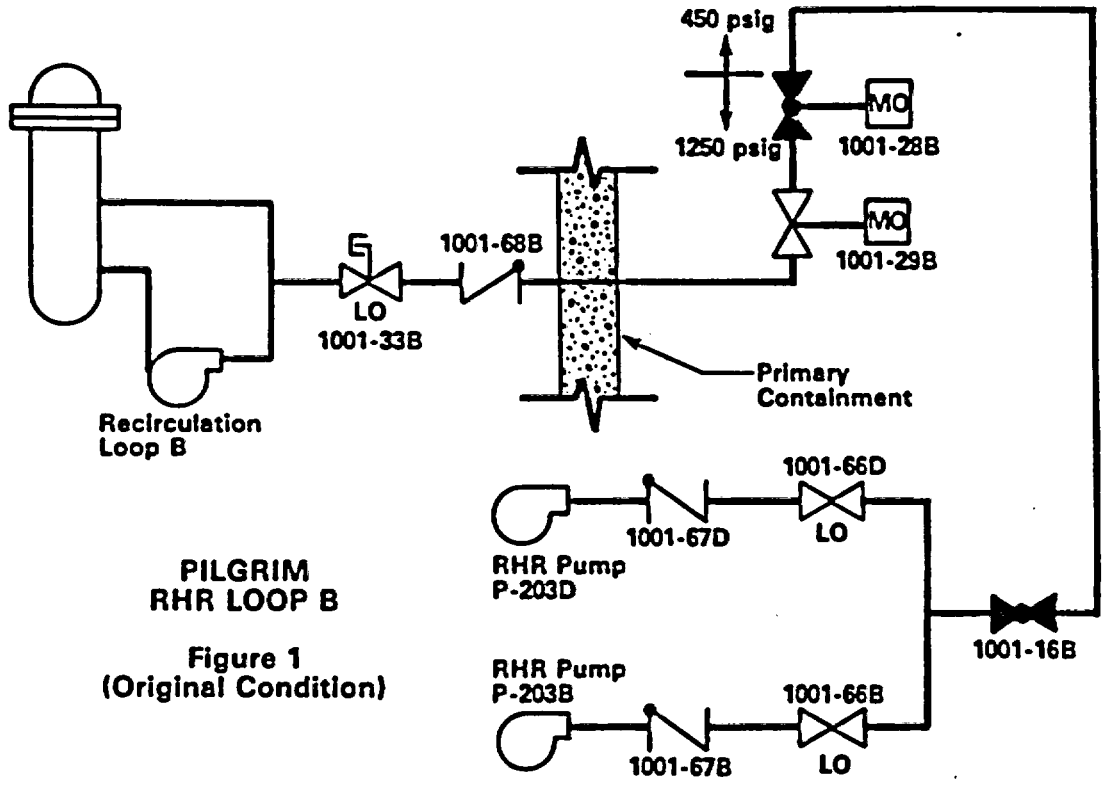
No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the Regional Administrator of the appropriate regional office or this office.

Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

Technical Contact: Mary S. Wegner
(301) 492-4511

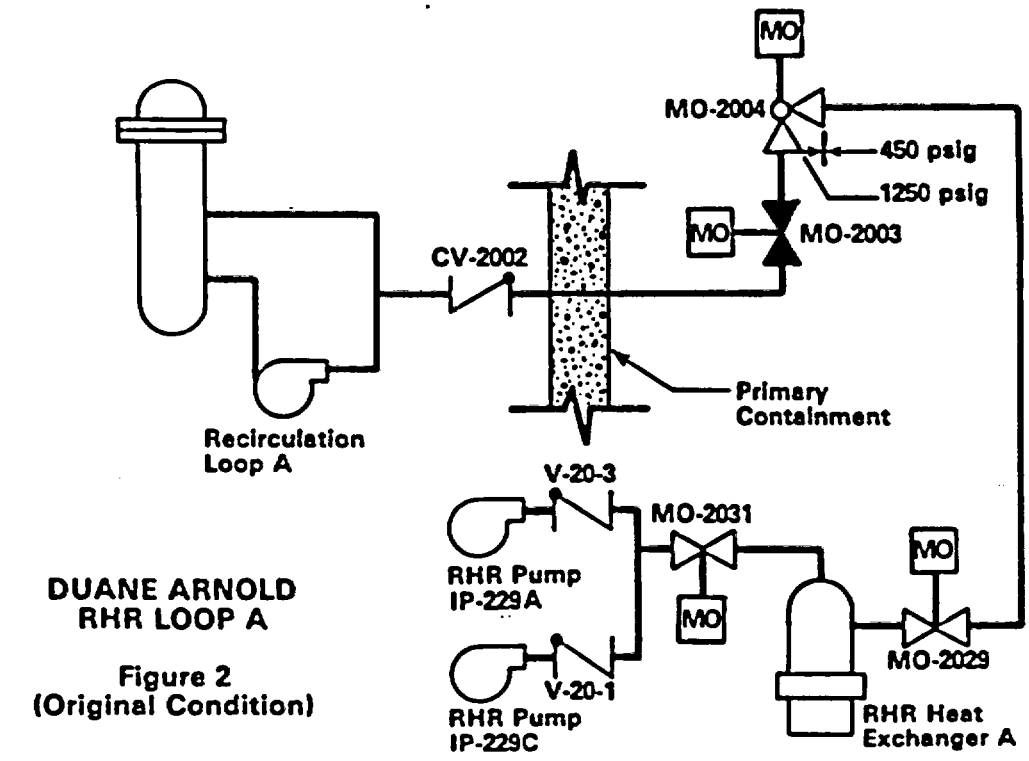
Attachments:
1. Simplified RHR Diagrams
2. List of Recently Issued IE Information Notices

# SIMPLIFIED RHR DIAGRAMS




**PILGRIM**
**RHR LOOP B**

**Figure 1**
**(Original Condition)**




**DUANE ARNOLD**
**RHR LOOP A**

**Figure 2**
**(Original Condition)**

# LIST OF RECENTLY ISSUED IE INFORMATION NOTICES

| Information Notice No. | Subject | Date of Issue | Issued to |
|---|---|---|---|
| 86-39 | Failures Of RHR Pump Motors And Pump Internals | 5/20/86 | All power reactor facilities holding an OL or CP |
| 86-38 | Deficient Operator Actions Following Dual Function Valve Failures | 5/20/86 | All power reactor facilities holding an OL or CP |
| 86-37 | Degradation Of Station Batteries | 5/16/86 | All power reactor facilities holding an OL or CP |
| 86-36 | Change In NRC Practice Regarding Issuance Of Confirming Letters To Principal Contractors | 5/16/86 | All power reactor facilities holding an OL or CP |
| 86-35 | Fire In Compressible Material At Dresden Unit 3 | 5/15/86 | All power reactor facilities holding an OL or CP |
| 86-34 | Improper Assembly, Material Selection, And Test Of Valves And Their Actuators | 5/13/86 | All power reactor facilities holding an OL or CP |
| 86-33 | Information For Licensee Regarding The Chernobyl Nuclear Plant Accident | 5/6/86 | Fuel cycle licensees and Priority 1 material licensees |
| 86-32 | Request For Collection Of Licensee Radioactivity Measurements Attributed To The Chernobyl Nuclear Plant Accident | 5/2/86 | All power reactor facilities holding an OL or CP |
| 86-31 | Unauthorized Transfer and Loss of Control of Industrial Nuclear Gauges | 5/6/86 | All power reactor facilities holding an OL or a CP |

OL = Operating License
CP = Construction Permit