

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

February 6, 1997

**NRC INFORMATION NOTICE 97-02: CRACKS FOUND IN JET PUMP RISER ASSEMBLY
ELBOWS AT BOILING WATER REACTORS**

Addressees

All holders of operating licenses or construction permits for boiling water nuclear power reactors (BWR) models 3, 4, 5 and 6 (BWR/3-6), except those licenses that have been amended to possession-only status.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees that cracking has been detected in a jet pump riser assembly at a location not previously known to have cracks. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to detect or avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

On November 26, 1996, General Electric Nuclear Energy (GENE) notified the NRC staff about cracking recently discovered in jet pump riser assembly elbows at a foreign BWR plant. The plant is approximately 25 years old. Cracks were discovered in 2 of the 10 jet pump riser assembly elbows while plant personnel were performing a visual examination (VT-1) using a remote underwater camera. The cracks were circumferential cracks in the 10-inch piping and were approximately 83 mm [3.27 in] and 112 mm [4.41 in] in length. No depth measurements were obtained because techniques for volumetric examination of this location do not currently exist.

As a result of the cracking found in the foreign BWR, GENE issued Service Information Letter (SIL) 605, "Jet Pump Riser Pipe Cracking," dated December 6, 1996, that provides recommendations for inspection and detection of jet pump riser pipe cracking [Accession No. 9612190076].

On January 15, 1997, the licensee for LaSalle Unit 2 notified the NRC staff about cracking found during its inspection of jet pump riser assembly elbows. The licensee, in performing visual inspections (enhanced VT-1) as recommended in GENE's SIL 605, found three

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indications in 2 of the 10 jet pump riser assembly elbows. Preliminary information provided to the NRC staff suggests that the indications ranged in length from approximately 20 mm to 150 mm [0.75 to 6 inches]. No depth measurements were taken. The smallest indication had an axial orientation; the other two indications were circumferential.

Discussion

Jet pumps are part of the reactor coolant recirculation system in BWR/3-6 plants. They are installed in the annulus between the core shroud and the reactor pressure vessel (RPV), and each vessel contains between 12 and 24 jet pumps. Most BWRs have 20 jet pumps. There are several BWR jet pump designs; however, the basic jet pump configuration is the same for all plants. Figure 1 is a schematic that shows the configuration of a typical jet pump and identifies the major components.

Each jet pump consists of a riser assembly, two inlet-mixer assemblies, two diffuser assemblies, and a riser brace. The riser assembly elbow is a 10-inch, 90 degree short radius elbow, fabricated from Type 304 stainless steel. It is welded to the recirculation inlet nozzle thermal sleeve. The riser assembly is supported near the top by the riser brace, which is welded to the riser pipe and to pads on the RPV wall (some plants have two riser braces for each riser). Lateral support is also provided by the jet pump restrainer brackets which attach the adjacent jet pump inlet mixers to the riser. The entrance end of each inlet-mixer assembly is clamped to the top of the riser transition piece by the beam-bolt assembly. The exit end of the inlet-mixer forms a slip joint with the entrance end of the diffuser. This interface between the inlet mixers and the diffusers provides some additional lateral support to the riser. The top of the slip joint is located near the bottom of the fuel; the exact elevation of the slip joint is plant specific.

The cracking in both the foreign BWR and the LaSalle Unit 2 occurred in the heat-affected zone of the weld connecting the jet pump riser elbow to a thermal sleeve. The characteristics of the cracking are indicative of intergranular stress corrosion cracking (IGSCC).

Separation of the jet pump riser piping could have a potential safety impact on some BWR plants under certain accident conditions. If the jet pump riser piping were to separate under normal operating conditions, there does not appear to be a safety concern in that the loss of a jet pump assembly would not cause a plant to lose its capability to safely shut down. According to GENE, a loss of one jet pump assembly would be detected by plant operators.

The BWR Owners Group Vessel and Internals Project (BWRVIP) is working closely with GENE and has provided a safety assessment, "Assessment of BWR Jet Pump Riser Elbow to

Thermal Sleeve Weld Cracking (BWRVIP-28)," dated December 1996, to the NRC staff [Accession No. 9701030009].

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

signed by D.B. Matthews

Thomas T. Martin, Director
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

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Keri A. Kavanagh, NRR
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Attachments:

1. Jet Pump Assembly Schematic
2. List of Recently Issued NRC Information Notices

Attachment filed in Tracked

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Tech Editor has reviewed and concurred on 01/08/97

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96-68	Incorrect Effective Diaphragm Area Values in Vendor Manual Result in Potential Failure of Pneumatic Diaphragm Actuators	12/19/96	All holders of OLs or CPs for nuclear power reactors
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OL = Operating License
CP = Construction Permit

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Thermal Sleeve Weld Cracking (BWRVIP-28)," dated December 1996, to the NRC staff [Accession No. 9701030009].

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Thermal Sleeve Weld Cracking (BWRVIP-28)," dated December 1996, to the NRC staff [Accession No. 9701030009]. ~~This report and GENE SIL 605 are being evaluated by the NRC staff.~~

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The NRC staff is evaluating BWRVIP-28 and GENE SIL 605 to determine whether additional generic actions are necessary.

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