

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

December 27, 1991

NRC INFORMATION NOTICE 91-87: HYDROGEN EMBRITTLEMENT OF RAYCHEM CRYOFIT
COUPLINGS

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees regarding the possible hydrogen embrittlement of Raychem Cryofit couplings that could result in failure. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to 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

In July 1991 at the Seabrook Station, the licensee measured an unidentified leakage rate exceeding the 1.0 gpm technical specification limit from the Reactor Coolant System while the plant was operating in Mode 1 at 100 percent power. The source of the leak was determined to be in the vicinity of the pressurizer and, following plant shutdown, was located specifically in the gas space sampling line coming from the pressurizer. The leak was caused by a 360-degree circumferential fracture at the midpoint of a Raychem Cryofit coupling. During subsequent line inspection, a second Cryofit coupling located in the same line fractured in a similar manner after an accidental physical impact. Both couplings are located downstream of the root isolation valve.

Discussion

Raychem Cryofit couplings are hollow cylindrical devices made of a special alloy (50 percent titanium and 50 percent nickel) called Tinel that expands as temperature is decreased and contracts as temperature increases (because of a phase change). When the coupling is properly installed, a rapid joining of two pipe ends can effectively be performed. The licensee performed a metallurgical examination of the failed couplings and of other couplings in the Seabrook Station, correlated the metallurgical findings with the various exposure environments, and determined that the cause of the coupling failure was hydrogen embrittlement of the Tinel. The licensee also determined that the combination of high hydrogen content in the exposure medium and high temperature was the critical determining factor. No other combination of

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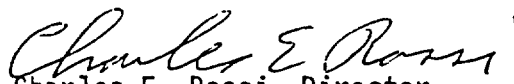
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exposure environments resulted in degradation of the Tinel. The vendor had been unaware of this application limitation for the Cryofit coupling since testing in these environments had not been performed.

To address the above findings, the licensee removed and replaced approximately 400 of the 3000 or more Cryofit couplings in the Seabrook Station with socket-welded joints or compression fittings. Many of the replacements were conservatively selected because of the safety implications if they should fail (closely connected to the Reactor Coolant System or located on containment penetrations).

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



Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical contact: Walter P. Haass, NRR
(301) 504-3219

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LIST OF RECENTLY ISSUED
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
91-86	New Reporting Requirements for Contamination Events at Medical Facilities (10 CFR 30.50)	12/27/91	All licensees authorized to use byproduct materials for human use.
91-85	Potential Failures of Thermostatic Control Valves for Diesel Generator Jacket Cooling Water	12/26/91	All holders of OLs or CPs for nuclear power reactors.
91-84	Problems with Criticality Alarm Components/Systems	12/26/91	All Nuclear Regulatory Commission (NRC) fuel cycle licensees, interim spent fuel storage licensees, and critical mass licensees.
91-83	Solenoid-Operated Valve Failures Resulted in Turbine Overspeed	12/20/91	All holders of OLs or CPs for nuclear power reactors.
91-18, Supp. 1	High-Energy Piping Failures Caused by Wall Thinning	12/18/91	All holders of OLs or CPs for nuclear power reactors.
91-82	Problems with Diaphragms in Safety-Related Tanks	12/18/91	All holders of OLs or CPs for nuclear power reactors.
91-81	Switchyard Problems that Contribute to Loss of Offsite Power	12/16/91	All holders of OLs or CPs for nuclear power reactors.
91-80	Failure of Anchor Head Threads on Post-Tensioning System During Surveillance Inspection	12/11/91	All holders of OLs or CPs for nuclear power reactors.
91-79	Deficiencies in the Procedures for Installing Thermo-Lag Fire Barrier Materials	12/06/91	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
 CP = Construction Permit

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*Original Signed by
 Charles E. Rossi*

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