

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

April 18, 1988

NRC INFORMATION NOTICE NO. 88-13: WATER HAMMER AND POSSIBLE PIPING DAMAGE  
CAUSED BY MISAPPLICATION OF KEROTEST  
PACKLESS METAL DIAPHRAGM GLOBE VALVES

Addressees:

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

Purpose:

This information notice is being provided to alert addressees to potential problems resulting from the improper application of packless metal diaphragm valves supplied by the Kerotest Manufacturing Corp. 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 do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

Kerotest Y-pattern packless metal diaphragm globe valves are used in a variety of applications in nuclear power plant reactor systems. These valves are designed to meet each owner's equipment specifications. However, incidents have occurred involving flow throttling and reverse flow as a result of the misapplication of these valves.

On August 6, 1984, McGuire Unit 2 operators discovered a broken weld on the let-down line of the residual heat removal system. The system was in use at the time and contaminated water was spraying from the broken pipe and from the stem of a valve. A subsequent inspection revealed a number of damaged supports/restraints and a broken socket weld that had completely separated. On April 5, 1985, seven socket welds with crack indications were discovered on additional piping in this system, although no welds had failed as they had in the August 1984 event. The root cause of these problems was attributed to excessive piping vibration induced by "chugging" during reverse flow through Kerotest Y-pattern packless metal diaphragm globe valves.

On May 12, 1987, while Trojan operators were transferring water from the "A" accumulator via backflow through the fill line to the "D" accumulator, the fill line ruptured at the "A" accumulator nozzle-to-pipe weld. On May 23, 1987, after the broken line had been repaired, operators again attempted to transfer water, and the fill line ruptured at the same location. The cause of the event was attributed to backflow through the Kerotest Y-pattern packless metal diaphragm globe valve in the "A" accumulator fill line. This backflow created a cyclic

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vibration of the valve disk. This vibration induced high enough stresses in the fill line to cause the pipe rupture.

On February 22, 1988, while Braidwood Unit 1 was draining the "D" accumulator, the fill line ruptured at a location similar to the location of a break previously reported at Byron, which was not analyzed by the licensee. The break location was also similar to that at Trojan. This line has a Kerotest Y-pattern packless metal diaphragm globe valve installed. Analysis of the break determined that it was caused by high cycle fatigue. The licensee has not been able to rule out valve "chugging" as the cause of the high cycle fatigue.

Discussion:

Reverse flow through Kerotest Y-pattern packless metal diaphragm globe valves has caused broken piping welds at two nuclear plants and may be responsible for other broken welds where the root cause has not been identified. Because of the stem and disk design used in Kerotest Y-pattern packless metal diaphragm globe valves, these valves are not intended for applications that require flow throttling or that subject the valves to reverse flow. Reverse flow in these valves can result in "chugging" that induces flow vibrations and water hammer. It may not be clear to plant operating personnel that violating these application criteria can result in serious consequences such as weld cracks and pipe ruptures that breach the primary coolant pressure boundary.

The manufacturer's product literature did not clearly state that certain valve types should not be subjected to reverse flow or used for flow throttling. Older issues of Kerotest instruction and engineering manuals do not warn users of the valves' unidirectional flow properties. More recent editions have corrected this deficiency; however, licensees may not have the corrected manual.

Purchase specifications may have been written without regard to flow directionality because the manufacturer's literature did not note its importance. This may have caused the improper use of these valves in applications where bi-directional flow is anticipated either in normal operation or in coping with emergency situations that require other-than-normal plant lineups.

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

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

Technical Contact: Rudy O. Karsch, NRR  
(301) 492-1178

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED  
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
88-12	Overgreasing of Electric Motor Bearings	4/12/88	All holders of OLs or CPs for nuclear power reactors.
88-11	Potential Loss of Motor Control Center and/or Switchboard Function Due to Faulty Tie Bolts	4/7/88	All holders of OLs or CPs for nuclear power reactors.
88-10	Materials Licensees: Lack of Management Controls Over Licensed Programs	3/28/88	All NRC licensees authorized to use byproduct material.
87-44, Supp. 1	Thimble Tube Thinning in Westinghouse Reactors	3/28/88	All holders of OLs or CPs for nuclear power reactors that employ a Westinghouse NSSS.
88-09	Reduced Reliability of Steam-Driven Auxiliary Feedwater Pumps Caused by Instability of Woodward PG-PL Governors	3/18/88	All holders of OLs or CPs for nuclear power reactors.
88-08	Chemical Reactions with Radioactive Waste Solidification Agents	3/14/88	All NRC licensees generating or processing low level radioactive waste.
88-07	Inadvertent Transfer of Licensed Material to Uncontrolled Locations	3/7/88	All NRC broad licensees and licensees authorized to possess byproduct material as sealed sources in teletherapy units or "self-contained" irradiators.
88-06	Foreign Objects in Steam Generators	2/29/88	All holders of OLs or CPs for PWRs.

OL = Operating License  
 CP = Construction Permit

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\*see previous concurrence

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RKarsch:db	RLobel	WLanning	AThomas	CBerlinger	CERoss
3/4/88	3/11/88	3/22/88	3/31/88	4/8/88	4/11/88

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