

Westinghouse Hanford Company

Sitewide Lessons Learned

YELLOW/CAUTION

Date: June 10, 1996

Number: 96I032

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FAILED OPEN STEAM TRAPS CAUSE WATER HAMMER

STEAM PRESSURE TRANSIENTS CAUSE WATER SEALS TO FLASH

SUMMARY:

Frequent pressure transients on a 30 psi steam system caused inverted bucket traps on that system to lose their prime and fail open. This allowed steam to pass into a drain line, causing water hammers and allowing steam to escape through vent lines and floor drains. No significant damage or personnel injuries occurred.

DETAILS:

On March 12, 1996, a 225-to-50 psi pressure regulating valve in PFP started to chatter and was taken off line. That valve feeds a 50-to-30 psi pressure regulating valve which supplies the 30 psi steam system. Pressure was controlled by throttling on bypass valves.

On March 28, a water hammer was noticed at two 45 degree elbows located just upstream of where the 30 psi main steam header end trap discharges into the building drain line. See Item 4 (trap T-2235-22D) in the drawing below. Pressure transients in the drain line caused water to backslash out of a nearby floor drain and a roof vent. Trap T-2235-22D was found to have failed open. This trap was isolated which stopped the water hammer and splashing of water from the floor drain and vent.

The next day another water hammer occurred farther downstream. Steam was seen coming out of all drain line vents and water was being blown out of some floor drains. Steam to the 30 psi header was secured to stop the hammering and

the steam flow through the drain. The failed traps were repaired and steam was restored to the system with steam pressure to the 50-to-30 psi pressure regulating valve still controlled with manual bypass valves. Several traps again failed open and passed steam into the drain system.

On April 4, the 30 psi steam system was secured to allow for manual priming of all traps and the troubleshooting of the failed 225-to-50 psi pressure regulating valve. On April 5 the 30 psi steam system was returned to service. All traps appeared to be working properly. No steam was coming from any of the drain line vents. The 225-to-50 psi pressure regulating valve continued to chatter and was taken off-line. While placing it back on line to troubleshoot the chattering, the 30 psi system experienced a momentary drop in pressure to less than 5 psig. During this transient, all branch steam traps failed open and steam was seen coming from all of the drain line vents. Water from the floor drain p-traps was being forced upwards back into the room. The 30 psi steam system was secured to avoid further pressurization of the drain header and another potential water hammer.

On April 15 the 225-to-50 psi pressure regulating valve was repaired and the 30 psi steam system was returned to service. No problems were encountered.

LESSONS LEARNED:

Low pressure differential across inverted bucket steam traps or sudden or frequent drops in steam pressure can cause the traps to lose their prime and fail open. Traps should be checked regularly for proper operation. Failed traps should be repaired expeditiously.

Introduction of large quantities of steam into a condensate line can result in a water hammer

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even if that line is vented. The location of vent lines, amount and temperature of the condensate, velocity of the steam, and condition and grade of the pipe affect the probability of occurrence and severity of water hammer.

Expeditious maintenance and repair of steam system components is necessary to maintain system control and eliminate the need for compensatory measures in the system operation.

REFERENCES: Occurrence Report RL--WHC-PFP-1996-0016

Steam Headers and Drain System Arrangement

