NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
McGuire Nuclear Station Unit 2	0 5 0 0 0 3 7 0	1 OF 0 4

TITLE (4)
Overpressurization of Auxiliary Feedwater Pump Suction

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
										0 5 0 0 0
0 8	3 0	8 4	8 4	— 0 2 5	— 0 0	1 0	2 6	8 4		0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
Scott Gewehr - Licensing	7 0 4 — 3 7 3 - 7 5 8 1

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
B	B A	V	B 3 5 0								

SUPPLEMENTAL REPORT EXPECTED (14)

		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X	YES (If yes, complete EXPECTED SUBMISSION DATE)				
	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On August 26 and 30, the turbine-driven auxiliary feedwater pump (TDAFP) experienced reverse rotation, causing the pump suction piping to become overpressurized. The cause of reverse rotation is attributed to a leaking swing check valve, which allowed water from steam generator (S/G) 2C to leak past and flash to steam, which displaced more water backwards toward the pump.

A second check valve in the line between the leaking swing check valve and the pump also failed to stop the reverse flow. It is theorized that the reverse flow caused by the leak was insufficient to actuate this stop check valve. As the leak continued, water was forced back through the pump to the suction side, where it was contained by another check valve. Eventually, the pressure rose in the pipe until it opened the relief line. Damage was confined to pump suction instrumentation. The damaged instrumentation and the leaking valve were replaced. There was no effect on the health and safety of the public.

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TEXT *(If more space is required, use additional NRC Form 366A's)* (17)

INTRODUCTION: On August 26 and August 30, 1984, the turbine driven auxiliary feedwater (DUKE: CA, EIIS:BA) pump experienced reverse rotation due to leaking check valves (EIIS:V). Two check valves, 2CA-49 and 2CA-22, allowed water from steam generator (EIIS:HX) 2C to rotate the pump (EIIS:P) backwards, overpressurizing the pump suction piping and damaging the internals of the pump suction instrumentation.

Swing check valve 2CA-49 (See Figure 1) contained a cracked weld in the valve's internals, which allowed water to leak past. Enough water leaked past check valve 2CA-49 to pressurize the piping, but not enough to move 2CA-22 to the check position. The water that leaked through was between 450° and 500°F at 1000 psig. When this water reached the low pressure side of 2CA-49, it flashed to steam and displaced some water. This process continued to displace water and heat up the pipe and the room. This displaced water moved toward the pump and the upper surge tank, but the flow was insufficient to check 2CA-22. The movement of the water passed through the pump and into the suction piping where it was contained by check valve 2CA-8. With the movement stopped, the pressure rose in the pipe until it opened the relief line.

The leak of 2CA-49 was sufficient to keep the relief valve open, but not enough flow passed through 2CA-22 to cause it to close. One possible explanation is that most of the flow was passing through 2CA-20AB to the condenser via the upper surge tank. A rise in level in the upper surge tank would go unnoticed by the operators since it dumps to the condenser when over-filled. The leakage of 2CA-49 had to be substantial, because it kept the relief valve in the pump suction open when most of the flow was going to the condenser via the upper surge tank.

Although 2CA-49 leaked, valve 2CA-22 may have closed if it had been installed properly. Valve 2CA-22 is installed in a vertical section of pipe. For this valve to operate properly, it must be installed in a horizontal section of pipe with the stem in the upright vertical position. Valve operation would then be aided by the force of gravity. The disk which checks on reverse flow, is free to move because it is not connected to the valve stem. In its application on the TDAFP, the force of gravity does not aid in closing the valve. The flow required to check the valve is greater than would be needed if the valve was installed correctly.

When the overpressurization occurred, the pump, piping, and hangers were inspected for possible damage. An inspection by Quality Control personnel of the piping and hangers revealed no damage. Mechanical Maintenance personnel inspected the pump for damage, by rotating the pump by hand. There was no indication that damage had occurred as a result of rotating backwards. It has been verified by engineering personnel that rotating the pump backwards at low rpm, for a short duration, should not have any effect on it.

On August 26, 1984, due to the high room teperature, the halon fire protection system actuated and discharged into the room. On August 30, 1984, the halon system was prevented from discharging into the TDAFP room by pressing the abort button on the control panel in the auxiliary feedwater pump room.

After 2CA-49 was removed, the valve was inspected and a crack was found in the seal weld on the seat ring. Mechanical Maintenance personnel believe that most of the leakage was through this crack, but this can not be proven. Cracks in this particular weld have occurred before. Check valve 2CA-37 had to be removed approximately six months ago for excessive leakage. Inspection of the valve revealed a crack in the same weld as in 2CA-49. Borg-Warner has been notified of the problem.

A review of the maintenance history of these CA check valves indicates that only 2CA-37 and 2CA-49 have been removed. These valves are Borg-Warner swing check valves with bonnet mounted clappers. Previous maintenance has been successfully performed on the CA valves. Before the first failure of 2CA-49 on August 26, the valve was successfully retested to 1700 psig with no leakage detected. Mechanical Maintenance personnel stated they have had success with their valves before, following maintenance, and 2CA-37 and 2CA-49 were the first that have given continuing problems.

According to the manufacturer (Borg-Warner), the defects in valves 2CA-49 and 2CA-37 occurred in an isolated production series which is not installed at Unit 1 or at Duke's Catawba Station. However, all of the valves in similar applications are being monitored (once per shift) at McGuire Units 1 and 2. Monitoring will continue until instrumentation is installed to detect reverse flow through the valves.

This instrumentation will be installed by the next scheduled refueling outage for each Unit. Valve CA-22 and the valves in corresponding applications in Units 1 and 2 will be relocated during the Spring 1985 refueling outage for each unit.

SAFETY ANALYSIS: In spite of the fact that the suction piping was overpressurized, the pump was still able to perform its safety function. There was no steam binding of the pump when the control operators ran the pump to cool the pipe and exercise 2CA-49. The presence of the check valve in the suction piping prevented damage to the instrumentation of the other two pumps. The recirculation line, which is common to all three pumps, is vented to the condenser via the upper surge tank dome and can not be used to pressurize the other pumps. The damaged instrumentation may require the control operators to manually swap the suction of the affected pump to the nuclear service water system if the condenser or auxiliary feedwater storage tank is lost. Auto-swapover of the suction on the other two pumps would not be affected. The other two pumps remained operable throughout the event. The health and safety of the public were not affected by this incident.

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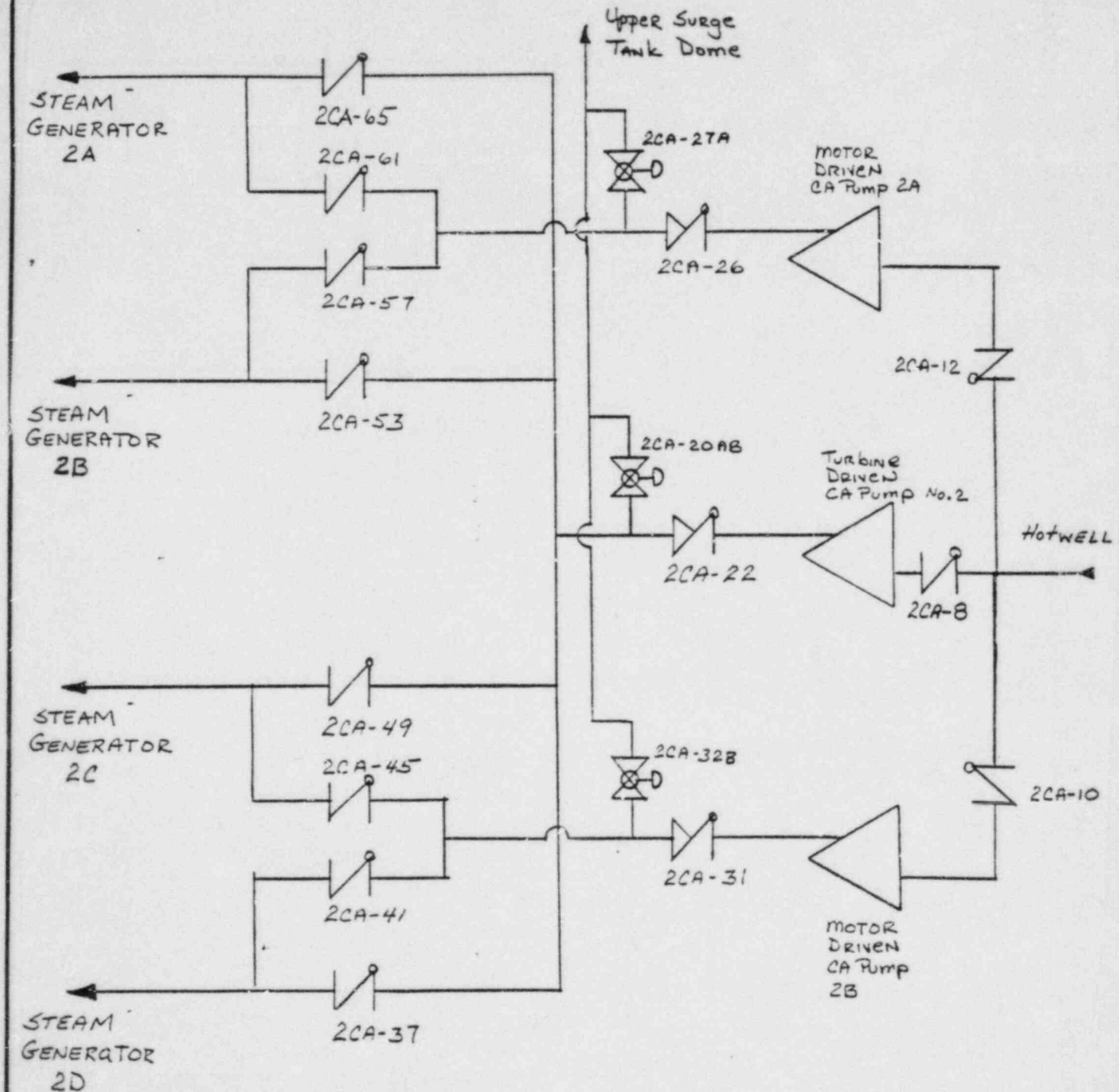
TEXT (If more space is required, use additional NRC Form 366A's) (17)

FIGURE 1



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HAL B. TUCKER
VICE PRESIDENT
NUCLEAR PRODUCTION

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October 26, 1984

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: McGuire Nuclear Station, Unit 2
Docket No. 50-370
LER 370/84-25

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report 370/84-25 concerning overpressurization of auxiliary feedwater piping, which is submitted in accordance with §50.73 (a)(2)(v). This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Hal B. Tucker

SAG/mjf

Attachment

cc: Mr. James P. O'Reilly, Regional Administrator
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