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R. E. DENTON
GENERAL MANAGER
CALVERT CLIFFS

February 14, 1991

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 and 2; Docket Nos. 50-317 and 50-318;
License Nos. DPR 53 and DPR 69
Licensee Event Report 90-030, Revision 00

Gentlemen:

The attached report is being sent to you as required under 10 CFR 50.73 guidelines. Should you have any questions regarding this report, we will be pleased to discuss them with you.

Very truly yours,

RED/DWM/bjd
Attachment

cc: D. A. Brune, Esquire
J. E. Silberg, Esquire
R. A. Capra, NRC
D. G. McDonald, Jr., NRC
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Director, Office of Management Information
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NRC FORM 366 (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

APPROVED OMB NO. 3150-0104
EXPIRES 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Calvert Cliffs, Unit 1	0 5 0 0 0 3 1 7	1 OF 0 7

TITLE (4) Fatigue Cracking in the Safety Injection Tank Nitrogen Vent Line Welds Due to Design Engineering Personnel Error

EVENT DATE (5)			LER NUMBER (6)				RPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR		SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
										Calvert Cliffs, Unit 2	0 5 0 0 0 3 1 8
1 2	0 4	9 0	9 0	-	0 3 0	- 0 0	0 2	1 4	9 1		0 5 0 0 0

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)					
POWER LEVEL (10)	0 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)	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)	X 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
D. W. Muth, Compliance Engineer	3 0 1 2 6 0 - 3 5 9 2

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

CAUSE	SYSTEM	COMPONENT	MANUFAC TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC TURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)

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

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

On December 4, 1990 with Unit 1 in MODE 5 at 170 degrees and 180 psia, we inspected the nitrogen vent lines on top of tanks 11B and 12B and found cracks in the structural weld at the coupling-to-vent line junction. We found no similar cracks in the other Unit 1 SITs (11A and 12A) or the Unit 2 SITs. We could not determine the ability of the cracked lines to withstand a Safe Shutdown Earthquake concurrent with a Loss of Coolant Accident. This placed the plant outside its design basis.

The root cause of this event was personnel error in that design engineers failed to recognize a cantilever condition during replacement of the SIT relief valves.

The relief valves on all four tanks for both units were relocated to the nitrogen supply line at the base of the tanks and adequately supported to prevent recurrence of this event.

A special training session will be held with Design Engineering personnel to review the major issues associated with this modification and to reinforce the program requirements regarding pre- and post-design walkdowns.

This event will be reviewed with engineering personnel in future Code training classes.

I. DESCRIPTION OF EVENT

On December 1, 1990 we shutdown Unit 1 to repair leaks in the Safety Injection Tank (SIT) Nitrogen Supply System. On December 4, 1990, with the Unit in MODE 5 at 170 degrees and 180 psia, we inspected the nitrogen vent lines on top of tanks 11B and 12B and found cracks in the structural weld at the coupling-to-vent line junction (see Figure 1). We found no similar cracks in the other Unit 1 SITs (11A and 12A) or the Unit 2 SITs.

BACKGROUND

Each Calvert Cliffs Unit has four SITs, each of which contains borated water under a nitrogen blanket. The nitrogen blanket is pressurized to 200 to 250 psi per Technical Specifications to force the water into the Reactor Coolant System in the event of a large break Loss of Coolant Accident (LOCA). A relief valve was located on top of each tank to prevent overpressurization of the tank (see Figure 2).

In February of 1990, the relief valves on the SITs were replaced with higher capacity valves weighing 42 lbs. The original valves weighed 19 lbs.

Unit 1 was restarted on October 5, 1990 following a maintenance outage. On October 29, 1990 operators noted nitrogen leakage accumulating in the containment atmosphere. Unit 1 was not immediately shutdown since the operators were able to supply enough nitrogen to maintain SIT pressure, thereby meeting the SIT Technical Specification requirement. The leakage gradually increased and Unit 1 was shutdown on December 1, 1990 and the cracks were discovered on December 4, 1990. The cracks were circumferential, running approximately 150 degrees around the weld on tank 11B and 120 degrees around the weld on tank 12B. We determined the cracks to have been caused by high cycle fatigue. The cantilevered configuration of the relief line caused the valve to vibrate in one direction. The increase in weight on top of the vent line due to the new, heavier valves caused an increase in the moment applied to the weld when the valve vibrated. This increase in moment greatly decreased the number of fatigue cycles the weld could withstand.

II. CAUSE OF CONDITION

The root cause of this condition was the failure of design engineers to detect the cantilever condition during the replacement of the relief valves. This modification was reviewed by two qualified design engineers and received input from two others. Each of these engineers failed to recognize the lack of sufficient support for the valve in the direction perpendicular to the nitrogen relief line.

A contributor to this event was the difficulty in performing a pre-design walkdown of the system. A visual inspection of the valve configuration would have required erection of 40 feet of scaffolding. This was not done due to ALARA concerns. A walkdown during installation of the new valves was feasible but was not performed since the design based on drawings was deemed adequate.

Calvert Cliffs Instruction, CCI-126, "Administrative Control of Facility Change Request," did not contain sufficiently clear guidelines for performing the walkdowns or documenting reasons for their non-performance.

III. ANALYSIS OF CONDITION

On January 15, 1991, we determined that the ability of the cracked lines to withstand a Safe Shutdown Earthquake (SSE) could not be assessed without further analysis. Therefore, the nitrogen vent lines on both SITs 11B and 12B were assumed to fail during a SSE. Since three SITS are required to be capable of performing their design function in the event of a SSE concurrent with a large break LOCA, this event is reportable under 10 CFR 50.73(a)(2)(ii)(B) as a condition outside the plant's design basis.

This condition of vulnerability existed for less than a month. Within that time, no seismic event or LOCA occurred. There were therefore no safety consequences associated with this event.

The safety significance of this event is determined by its potential effects and its likelihood. The SITs are intended to provide an initial injection of borated water into the core in the event of a LOCA. This keeps the core covered until the High and Low Pressure Safety Injection systems begin supplying water. The SITs are pressurized with nitrogen to provide a motive force for injecting water into the core. Loss of nitrogen pressure would render the SITs inoperable.

As stated above, the cracked lines are assumed to fail in the event of a SSE. This would render two of the tanks unavailable in the event of a concurrent LOCA. With only two SITs available, [illegible] which is assumed to feed the break and therefore not cool the core, an insufficient amount of cooling water would reach the core. This event was thus potentially safety significant.

Since the Reactor Coolant System is designed to withstand a SSE, a seismic event is not assumed to initiate a LOCA. The two occur independently. In the LOCA Safety Analysis, the time between initiation of a LOCA and the SITs emptying is approximately two minutes. For the scenario in which a LOCA precedes a SSE, the SSE would have to occur within two minutes of the LOCA for this condition to have any safety significance. Technical Specifications require that, upon the loss of more than one SIT, the plant shall be in MODE 4 within 13 hours. For the scenario in which a SSE precedes a LOCA, the LOCA would have to occur within 13 hours following a SSE which damaged the affected SITs for this condition to have

any safety significance. That a LOCA and a SSE would occur independently within this relatively small amount of time is extremely unlikely.

Based on the fact that the scenario of concern was extremely unlikely and the fact that it never did occur, we have concluded that this event actually had minor operational safety significance and had no effect on the health and safety of the public or plant personnel.

IV. CORRECTIVE ACTIONS

1. The relief valves on all four tanks for both units were relocated to the nitrogen supply line at the base of the tanks and adequately supported to prevent recurrence of this event (see Figure 3).

2. A special training session has been held with Design Engineering personnel to review the major issues associated with this modification and to reinforce the program requirements regarding pre- and post-design walkdowns.

3. This event will be reviewed with engineering personnel during future Code training classes.

4. CCI-126 will be revised to clarify walkdown requirements and require documentation of reasons for non-performance of walkdowns.

V. ADDITIONAL INFORMATION

LER 318/87-004 documented a similar event in which unanticipated engineering problems resulted in high cycle fatigue failure of inlet piping to a relief valve in the Shutdown Cooling/Low Pressure Safety Injection System header. The original pipe had cracked and a standard repair was made which subsequently failed. This event did not involve an overlooked cantilever condition.

	IEEE 803 EIIS Funct	IEEE 805 System ID
SIT	TK	BQ
SIT Nitrogen Supply	N/A	LK
SIT Relief Valve	RV	BQ

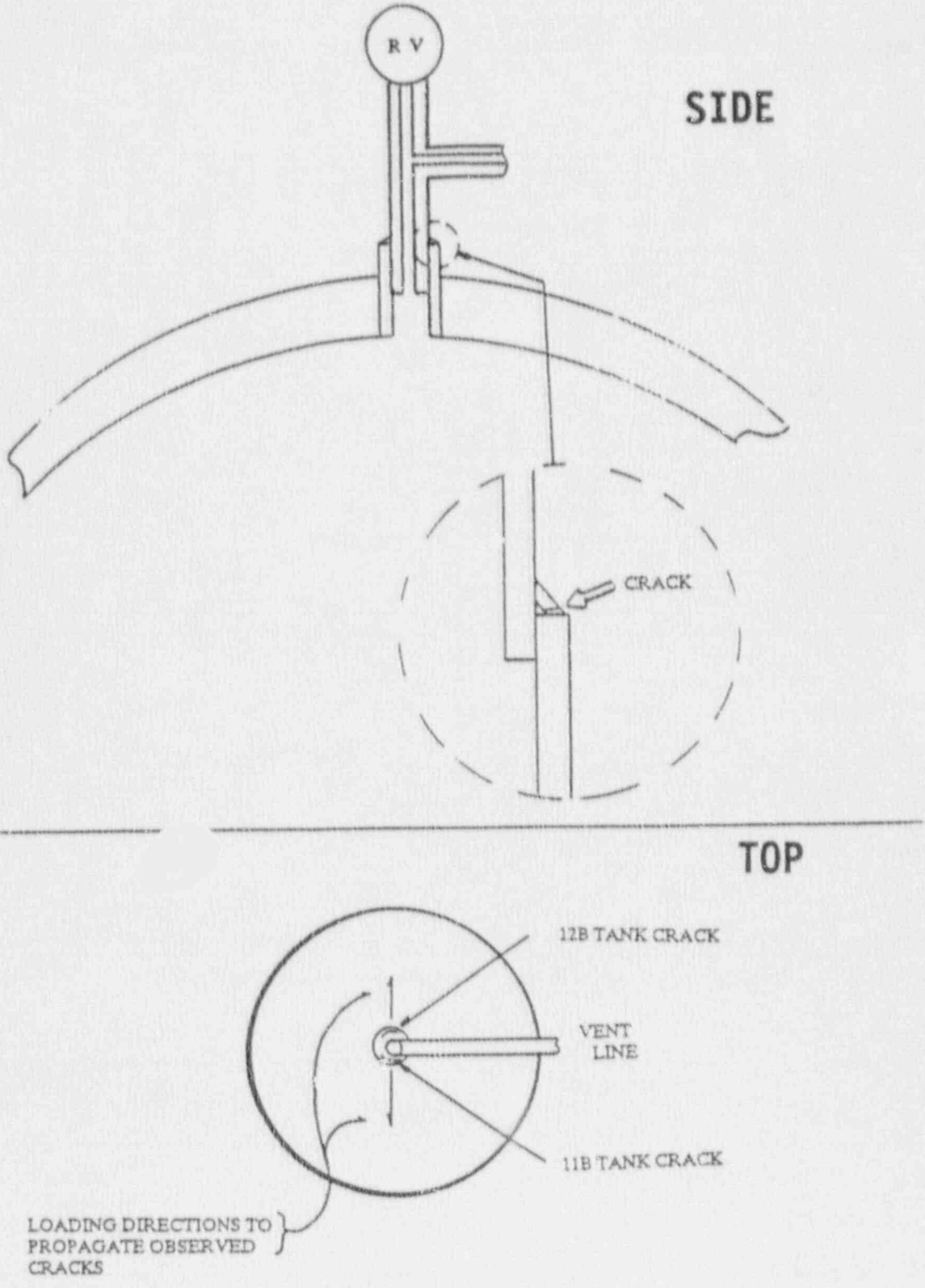

FIGURE 1: SAFETY INJECTION TANK

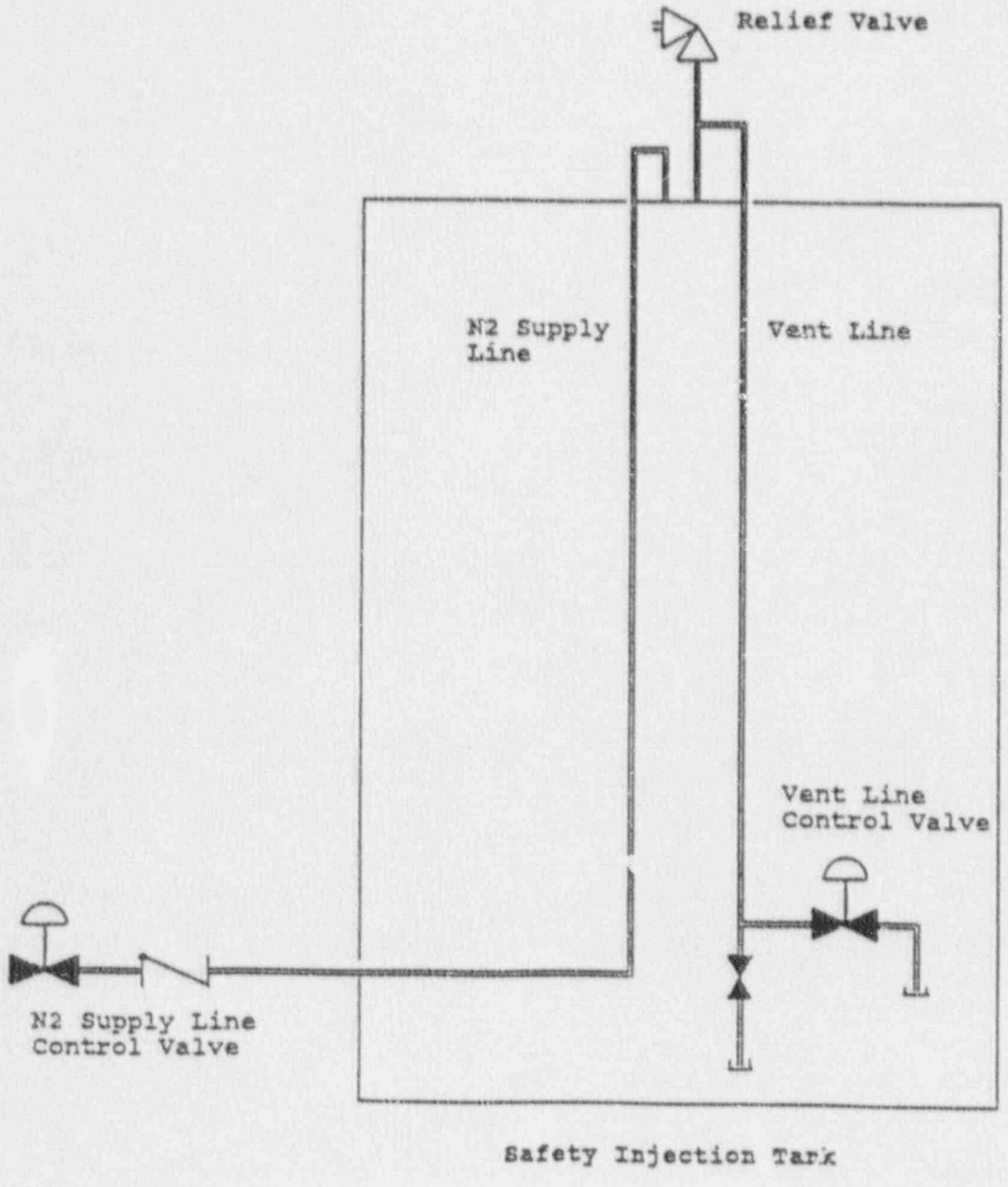

FIGURE 2: INITIAL CONFIGURATION

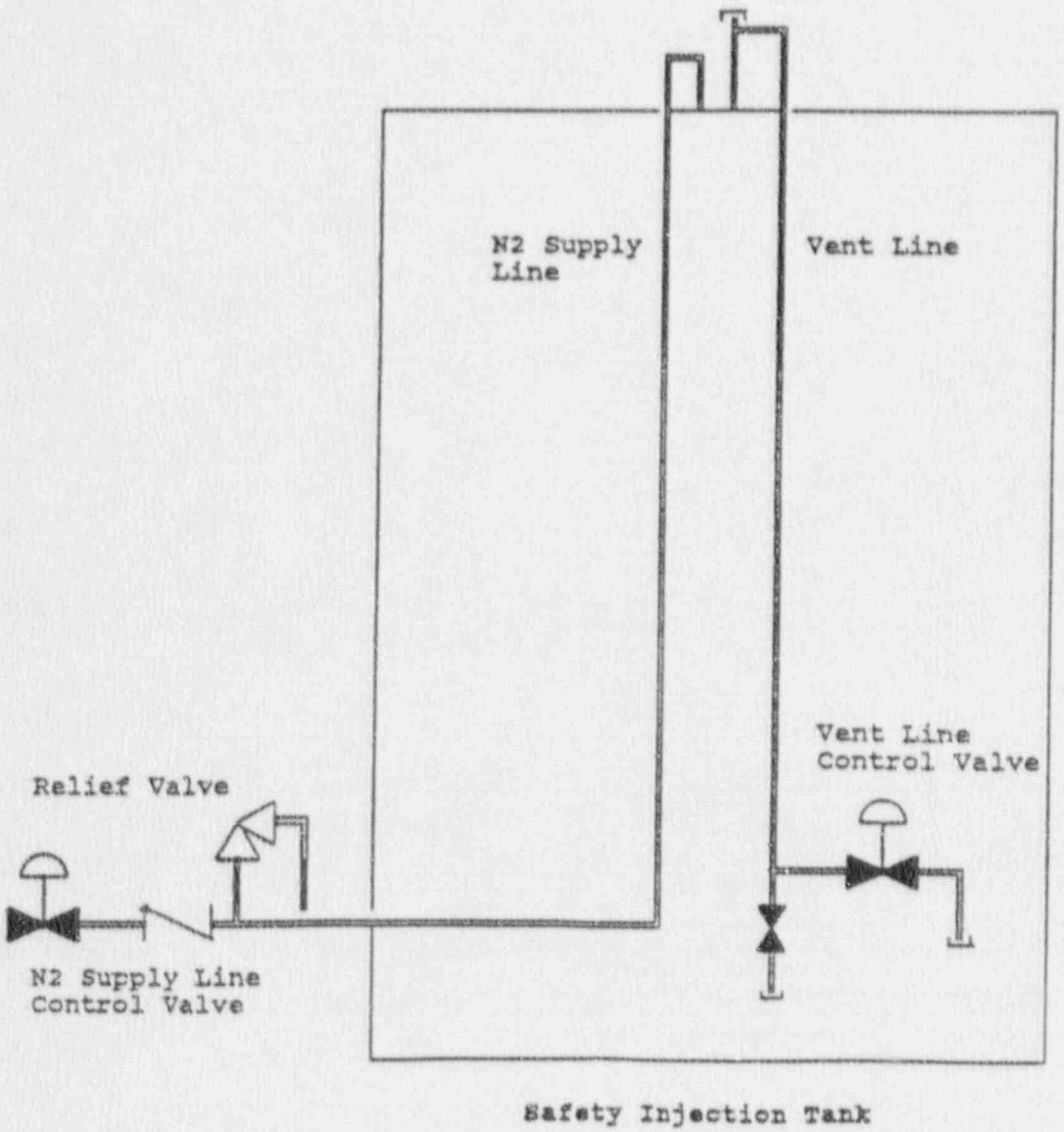

FIGURE 3: REVISED CONFIGURATION