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PG&E Letter DCL-00-108

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Docket No. 50-275, OL-DPR-80

Docket No. 50-323, OL-DPR-82

Diablo Canyon Units 1 and 2

Licensee Event Report 1-2000-003-00

Non Load Bearing Walls in the Turbine Building Do Not Meet Design Requirements  
Due to Personnel Error

Dear Commissioners and Staff:

In accordance with NUREG-1022, Revision 1, Section 2.9, PG&E is submitting the enclosed voluntary licensee event report regarding the discovery of several non load bearing concrete walls in the turbine building that do not meet design requirements due to personnel error.

Sincerely,

David H. Oatley

cc: Steven D. Bloom  
Ellis W. Merschoff  
David L. Proulx  
Diablo Distribution  
INPO

Enclosure

LMP/2246/N0002101

IE22

# LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) <b>Diablo Canyon Unit 1</b>										DOCKET NUMBER (2) <b>0 5 0 0 0 2 7 5</b>					PAGE (3) <b>1 OF 7</b>			
TITLE (4) <b>Non Load Bearing Walls in the Turbine Building Do Not Meet Design Requirements Due to Personnel Error</b>																		
EVENT DATE (5)			LER NUMBER (6)					REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)							
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER			REVISION NUMBER		MO	DAY	YEAR	FACILITY NAME				DOCKET NUMBER		
<b>08</b>	<b>18</b>	<b>1999</b>	<b>2000</b>	<b>-</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>-</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>02</b>	<b>2000</b>	<b>Diablo Canyon Unit 2</b>				<b>0 5 0 0 0 3 2 3</b>
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11)																
<b>1</b>		<div style="display: flex; justify-content: space-between;"> <span><b>10 CFR</b></span> <span><b>OTHER</b></span> <span><b>Voluntary</b></span> </div>																
POWER LEVEL (10)		(SPECIFY IN ABSTRACT BELOW AND IN TEXT, NRC FORM 368A)																
<b>1</b>	<b>0</b>	<b>0</b>																

LICENSEE CONTACT FOR THIS LER (12)										TELEPHONE NUMBER	
<b>Roger Russell - Senior Regulatory Services Engineer</b>										AREA CODE	
										<b>805</b>	<b>545-4327</b>

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)					EXPECTED SUBMISSION DATE (15)			MON	DAY	YR
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)					<input checked="" type="checkbox"/> NO					

ABSTRACT (Limit to 1400 spaces. I.e., approximately 15 single-spaced typewritten lines.) (16)

On August 18, 1999, with Units 1 and 2 in Mode 1 at 100 percent power, PG&E determined that several non load bearing concrete walls in the turbine building did not meet design requirements applicable to a postulated Hosgri seismic event. In addition, some of the attached components and commodities did not satisfy similar design requirements. PG&E determined that although some design requirements were not met, the walls and supported components would have been capable of performing their safety functions.

The condition was discovered by a PG&E engineer while evaluating the effect of a proposed plant modification.

The condition was caused by personnel error and an inadequate design process. The original designers apparently did not consider the potential that quality-related equipment would be mounted on the walls. In addition, the calculation for a Hosgri seismic event did not consider the cumulative effect of the mounted equipment.

Confirmatory reviews and calculations were completed to assure that all safety functions were maintained. The calculations identified the need to implement physical modifications to restore adequate design margin. Administrative controls including drawings, procedures, and the Q-List were changed to prevent recurrence.

# LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)									LER NUMBER (6)						PAGE (3)		
										YEAR	SEQUENTIAL NUMBER				REVISION NUMBER			
Diablo Canyon Unit 1	0	5	0	0	0	2	7	5	2000	-	0	0	3	-	0	0	2	OF 7

TEXT

## I. Plant Conditions

Units 1 and 2 were in Mode 1 (Power Operation) at 100 percent power.

## II. Description of Problem

### A. Background

The Unit 1 and Unit 2 turbine building is designated as Design Class II (except for some portions which are designated as Design Class I), but houses some Design Class I equipment: principally, the emergency diesel generators (EDGs), associated vital switchgear, and the component cooling water heat exchangers. The turbine building also contains some Design Class I piping, raceways, and ductwork. To protect the Class I equipment from earthquake damage, PG&E committed that equipment would be protected from damage due to the failure of any portion of the structure designed to Class II requirements.

The applicable seismic design requirements are associated with a postulated 7.5 magnitude earthquake on the Hosgri fault resulting in a 0.75g effective acceleration at the site.

Non load bearing reinforced concrete walls are located in several areas of the turbine building. In general, these walls were originally designed to function as 3-hour fire barriers. The walls are fixed at the bottom to the reinforced concrete slab by dowels or attachments to embedded plates, pinned at the top by structural angles or tees to the floor slab above, and free on their sides with expansion joints. The walls are effectively decoupled from the primary load-resisting system of the turbine building (i.e., floor diaphragms, columns, and shear walls) and are not subject to the building's vertical and lateral forces associated with the Hosgri seismic event. Consequently, these walls are considered to be "non load bearing" walls. However, the walls should have been designed to resist their own inertial effects and the reactions from attached components during the Hosgri event.

Several of the walls support safety-related and/or seismically qualified components. These include electrical raceways, control panels, tanks, switches and relays, instrument tubing and supports, piping and pipe supports, doors, HVAC ducting and supports, fire water piping, and various other items. In addition, several of the walls are in the vicinity of seismically

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)								LER NUMBER (6)						PAGE (3)				
									YEAR	SEQUENTIAL NUMBER				REVISION NUMBER					
Diablo Canyon Unit 1	0	5	0	0	0	2	7	5	2000	-	0	0	3	-	0	0	3	OF	7

TEXT

induced system interaction (SISI) targets. Therefore, the structural integrity of the walls is required to prevent interaction with any target.

The acceptance criteria for concrete walls is identified in the Final Safety Analysis Report (FSAR) Section 3.8.5.1 and design criteria memorandum (DCM) T-4, "Structural Design of the Turbine Building."

### B. Event Description

On July 22, 1999, a PG&E engineer reviewed proposed security modifications which placed a minor new load on EDG walls. The engineer recognized the walls were not the typical structural concrete walls but non load bearing walls, and concluded that they may not be able to support the additional loads. As a result of this concern, the modification was changed to avoid adding new loads, and an investigation was initiated to determine the extent of the condition and whether other walls and associated components were affected.

The investigation identified the following:

1. The walls surrounding the Unit 1 EDGs did not satisfy the applicable design requirements, but would remain intact, maintaining their capability to support the attached components and commodities, and not become SISI sources through excessive deflection. In addition, some of the attached components and commodities did not meet applicable design requirements, but would be capable of performing required safety functions during a Hosgri seismic event.
2. The conditions of the Unit 2 walls were similar and judged to be bounded by the Unit 1 walls.
3. The condition was also applicable to the Unit 1 and Unit 2 east and west walls of the 12 kV switchgear rooms.

As a result of the investigation, PG&E began performing confirmatory analyses in seven distinct areas including: 1) concrete walls, 2) electrical raceways, 3) equipment, 4) instrument tubing and tubing supports, 5) pipe stress and pipe support, 6) personnel and roll-up doors, and 7) HVAC duct and duct supports.

On August 18, 1999, PG&E concurred with the determination that these walls and supported equipment did not meet design requirements applicable to a postulated Hosgri seismic event, but were judged to be operable. On October 22, 1999, operability evaluation (OE) 99-05, Revision 0 was approved, confirming the walls and attached equipment



# LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)									LER NUMBER (5)						PAGE (3)			
										YEAR	SEQUENTIAL NUMBER				REVISION NUMBER				
Diablo Canyon Unit 1	0	5	0	0	0	2	7	5	2000	-	0	0	3	-	0	0	4	OF	7

TEXT

were capable of performing their intended safety functions in the event of a Hosgri earthquake. The OE was revised on January 21, 2000, and again on March 10, 2000, to incorporate the results of the ongoing analyses.

While design requirements were not met, the condition was not reported as being outside design basis because the walls and attached equipment were found capable of performing their intended safety functions in the event of a Hosgri earthquake, and therefore the plant design basis was met.

**C. Inoperable Structures, Components, or Systems that Contributed to the Event**

None.

**D. Other Systems or Secondary Functions Affected**

None.

**E. Method of Discovery**

A PG&E engineer reviewed proposed security modifications which placed a minor new load on EDG exterior walls. The engineer recognized the walls were not the typical structural concrete walls but non load bearing walls, and concluded that they may not be able to support the additional loads.

**F. Operator Actions**

None.

**G. Safety System Responses**

None.

**III. Cause of the Problem**

**A. Immediate Cause**

The immediate cause of the non load bearing walls exceeding design requirements was an inadequate design.

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)									LER NUMBER (6)						PAGE (3)			
										YEAR	SEQUENTIAL NUMBER				REVISION NUMBER				
Diablo Canyon Unit 1	0	5	0	0	0	2	7	5	2000	-	0	0	3	-	0	0	5	OF	7

TEXT

### B. Root Cause

The root cause could not be conclusively determined due to the lack of detailed documentation and the amount of time that had passed since the original design and construction. The following are presumptive causes:

1. Personnel errors on the part of the original wall designers for failing to consider the likelihood that quality-related equipment would be supported by these walls.
2. Personnel errors on the part of the engineers who performed the wall calculation for the Hosgri seismic event for failing to incorporate the as-built configuration of the walls into the calculations.

### C. Contributory Cause

Contributory causes included:

1. The engineering department was compartmentalized during original construction. The engineers responsible for designing the walls were in a different group than the engineers responsible for evaluating additional loads on the walls, which impacted communication and interaction between the groups.
2. The engineering department was located offsite where they relied on complex drawings, with limited opportunity to perform walkdowns of the walls and equipment.
3. The design classification of the walls was not clearly defined in engineering documents, resulting in assumptions that the walls were equivalent in construction to load bearing walls. The walls were not reviewed under the design verification program during plant licensing.
4. Engineers only evaluated local effects on the walls when equipment was being added and assumed the reinforced concrete walls were inherently strong enough to resist the loads of additional equipment.

### IV. Analysis of the Event

The non load bearing walls support attached Design Class I equipment and firewater piping. They also maintain structural integrity, to preclude damage to adjacent Design Class I equipment during a design basis Hosgri seismic event.

# LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)								LER NUMBER (6)							PAGE (3)			
									YEAR	SEQUENTIAL NUMBER					REVISION NUMBER				
Diablo Canyon Unit 1	0	5	0	0	0	2	7	5	2000	-	0	0	3	-	0	0	6	OF	7

## TEXT

The non load bearing walls provide a 3-hour fire barrier to prevent the spread of a fire to the adjacent areas. However, these walls are not required to provide the fire barrier function concurrent with natural phenomenon. Since the identified walls could potentially deflect excessively during a seismic event, they may not be capable of performing their required fire barrier functions.

PG&E concluded that the structural integrity of the walls, equipment, and components is assured and that these items are capable of performing their intended safety functions in the event of a Hosgri earthquake. The safety significance of this condition was also evaluated against the Long Term Seismic Program (LTSP) probabilistic risk assessment (PRA). The LTSP considers seismic events even more severe than Hosgri, and considers the fragilities of key components including the control and excitation panels for the EDGs. The results of this evaluation concluded the condition was not risk significant.

Therefore, the condition is not considered a safety system functional failure and there were no adverse effects on the public health and safety.

## V. Corrective Actions

### A. Immediate Corrective Actions

PG&E performed a detailed investigation to determine the extent of the problem and the walls affected. The seismically qualified equipment and commodities supported by and in the vicinity of these walls were identified and incorporated into an OE. PG&E performed confirmatory evaluations and calculations to determine whether design requirements were met. PG&E evaluated the areas where the design requirements were not met and concluded the walls and supported components would perform their safety function had a Hosgri event occurred. Also, the following enhancements were made.

- a) The Q-list was amended to clearly identify the design classification of non load bearing walls.
- b) DCM T-4 was revised to clarify the design criteria for the non load bearing walls.
- c) A new drawing was issued to clearly show the location of non load bearing walls.

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FACILITY NAME (1)	DOCKET NUMBER (2)									LER NUMBER (6)						PAGE (3)		
										YEAR	SEQUENTIAL NUMBER				REVISION NUMBER			
Diablo Canyon Unit 1	0	5	0	0	0	2	7	5	2000	-	0	0	3	-	0	0	7	OF 7

TEXT

### B. Corrective Actions to Prevent Recurrence

1. An evaluation of present-day design controls was performed to assure that adequate process controls exist to preclude recurrence. Overall, design controls were determined to be adequate, however, the following enhancements to the process are being made.
  - a) Procedure CF3.ID9, "Design Change Package Development," was revised to add a checklist that addresses non load bearing walls.
  - b) An evaluation of maintenance procedures will be performed to assure administrative controls are in place for adding components and commodities to non load bearing walls.
2. Design changes are being prepared and implemented to restore the design margin of the walls and attached commodities to fully satisfy the design requirements.

### VI. Additional Information

#### A. Failed Components

None.

#### B. Previous Similar Events

None.