

LICENSEE EVENT REPORT (LER)

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TITLE (4)
Auxiliary-Saltwater System Was Outside its Design Basis Because 10 CFR 50, Appendix R, Requirements Were Not Met Due to Personnel Error

EVENT DATE (5)				LER NUMBER (6)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)												
MON	DAY	YR	YR	SEQUENTIAL NUMBER		REVISION NUMBER		MON	DAY	YR	FACILITY NAME					DOCKET NUMBER							
10	17	97	97	-	0	0	4	-	0	0	11	17	97										

OPERATING MODE (9) 1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11) X 10 CFR 50.73(a)(2)(ii)(B)									
POWER LEVEL (10) 1 0 0	OTHER									
(SPECIFY IN ABSTRACT BELOW AND IN TEXT, NRC FORM 368A)										

LICENSEE CONTACT FOR THIS LER (12)									
Vickie A. Backman - Senior Regulatory Services Engineer								TELEPHONE NUMBER	
								AREA CODE 805	545-4289

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

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

ABSTRACT (16)

On October 17, 1997, at 1630 PDT, with Unit 2 in Mode 1 (Power Operation) at 100 percent power, PG&E determined that the auxiliary saltwater system (ASW) safe shutdown electrical circuits did not meet 10 CFR 50, Appendix R, requirements and were therefore outside the design basis of the plant. Two pull boxes did not have adequate fire protection separation. These pull boxes contained redundant ASW safe shutdown circuits, and a fire in either pull box could result in the loss of both trains of ASW. A 1-hour, non-emergency report was made to the NRC in accordance with 10 CFR 50.72(b)(1)(ii)(B) at 1657 PDT, on October 17, 1997. A preliminary investigation has determined that this condition does not affect Unit 1 ASW safe shutdown circuits.

On October 17, 1997, at 1630 PDT, a continuous firewatch was established as an interim compensatory measure.

The root cause of this event is personnel error (cognitive) in that the ASW safe shutdown circuits were incorrectly evaluated as being entirely embedded; thus the circuits did not receive 10 CFR 50, Appendix R, reviews.

The pull boxes will be modified to meet 10 CFR 50, Appendix R, requirements. PG&E will also review other embedded pull boxes with safe shutdown equipment cables to ensure that 10 CFR 50, Appendix R, requirements are met.

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I. Plant Conditions

Units 1 and 2 have been in various Modes and at various power levels with the conditions described below.

II. Description of Problem

A. Summary

On October 17, 1997, at 1630 PDT, with Unit 2 in Mode 1 (Power Operation) at 100 percent power, PG&E determined that two auxiliary saltwater system (ASW) (BI) safe shutdown circuits (CBL5) were routed through two pull boxes (PBX) that did not have adequate fire protection separation as required by 10 CFR 50, Appendix R, and were therefore outside the design basis of the plant. The pull boxes each contain redundant trains of circuits associated with the ASW; a fire in either pull box could result in the loss of both trains of ASW. A preliminary investigation has determined that this condition does not affect Unit 1 ASW safe shutdown circuits.

B. Background

10 CFR 50, Appendix R, Section III.G.2, requires that one train of redundant systems necessary to achieve and maintain hot shutdown conditions and located within the same fire area, is free from fire damage by requiring one of the following:

- a. Separation of redundant circuits by a fire barrier having a 3-hour fire rating.
- b. Separation of redundant trains by a horizontal distance of more than 20 feet with no intervening combustible or fire hazards, in conjunction with fire detectors (DET) and an automatic fire suppression system installed in the fire area.
- c. Enclosure of cable and equipment of one redundant train in a fire barrier having a 1-hour rating, in conjunction with fire detectors and an automatic fire suppression system installed in the fire area.

Diablo Canyon Power Plant (DCPP) Equipment Control Guideline (ECG) 18.7, "Fire Rated Assemblies," requires that all fire rated enclosures



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protecting safety related areas or separating redundant safe shutdown circuits and equipment shall be functional. With a fire rated assembly nonfunctional, the ECG requires that a continuous firewatch on at least one side of the affected assembly be established; or that the operability of fire detectors or the automatic fire suppression system on at least one side of the nonfunctional fire rated assembly be verified and an hourly firewatch patrol be established.

PG&E completed an initial 10 CFR 50, Appendix R, compliance review for Unit 1 in 1983 and for Unit 2 in 1984. The review consisted of reviewing the existing fire protection program against the specific requirements of 10 CFR 50, Appendix R. Since the ASW circuits were identified as being embedded, fire protection engineering personnel performing the 10 CFR 50, Appendix R, safe shutdown analysis excluded the circuits from further review.

In 1991, a self-assessment was performed by PG&E's Nuclear Excellence Team, in which weaknesses associated with emergency lighting, plant modifications, and configuration management were identified. The actions to correct the deficiencies involved reverifying the 1983-84 10 CFR 50, Appendix R, analysis and the configuration control program. Between 1991 and 1994 a reanalysis of safe shutdown circuits was performed to ensure that the circuits met the requirements of 10 CFR 50, Appendix R. The data provided by engineering for this analysis identified the Unit 2 safe shutdown ASW circuits as being embedded. Again, since the ASW circuits were identified as being entirely embedded, fire protection engineering personnel performing the 10 CFR 50, Appendix R, safe shutdown analysis excluded the circuits from further review.

C. Event Description

On October 14, 1997, utility engineering personnel reviewing design drawings for tornado missile potential for various pull box hatch covers, identified a 10 CFR 50, Appendix R, compliance concern with ASW circuits routed through a common pull box. Fire protection personnel were requested to evaluate pull box configurations for compliance with 10 CFR 50, Appendix R, Section III.G.2.

Fire protection personnel reviewed available engineering documentation and design drawings. Based on this preliminary evaluation, it was



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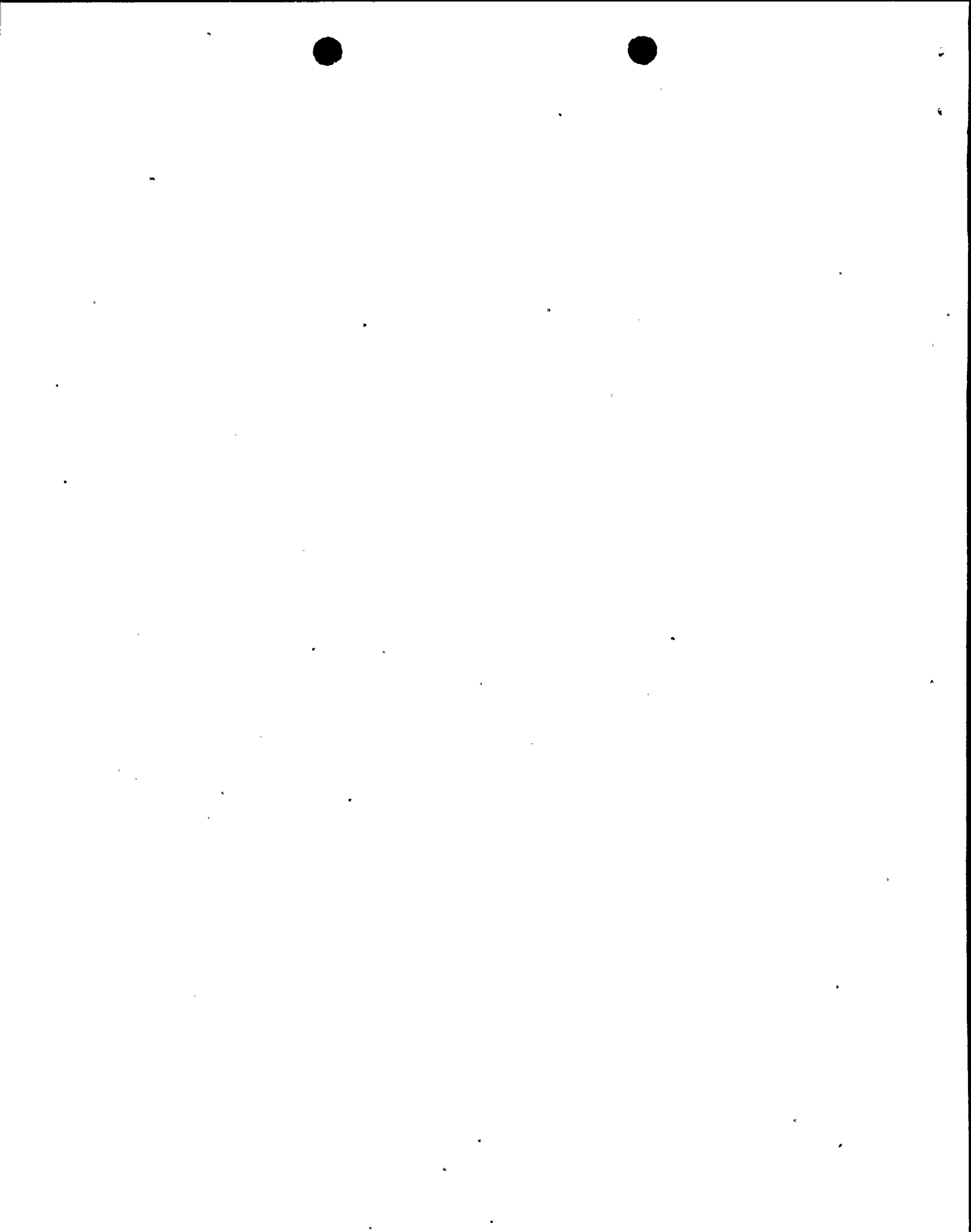
determined to be necessary to remove the pull box covers for a more detailed evaluation. The pull box covers were removed, and on October 17, 1997, at 1630 PDT, PG&E determined that ASW circuits routed through Unit 2 pull boxes BPO 33 and 43 were not entirely embedded from a fire protection standpoint, nor separated by qualified fire barrier material, and as such did not meet the requirements of 10.CFR 50, Appendix R, Section III.G.2. Thus the ASW system was outside its design basis. The circuits routed through pull boxes BPO 33 and 43 contain ASW 2-1 and 2-2 pump motor (BI)(MO) power and control cables and exhaust fan (BI)(FAN) E-102 and E-104 power cables (BI)(CBL4). A single fire in either of these pull boxes could result in the loss of both trains of ASW.

On October 17, 1997, at 1630 PDT, a continuous firewatch was established as an interim compensatory measure, in accordance with ECG 18.7.

On October 17, 1997, at 1657 PDT, a 1-hour, non-emergency report was made to the NRC in accordance with 10 CFR 50.72(b)(1)(ii)(B). Since the ASW safe shutdown circuits do not meet the requirements of 10 CFR 50, Appendix R, this condition was determined to be reportable as outside the design basis of the plant.

On October 28, 1997, PG&E installed temporary fire and smoke detection equipment in both pull boxes and implemented a roving hourly firewatch in place of the continuous firewatch.

Two redundant trains of circuits associated with the Unit 2 ASW pumps (BI)(P) were found to be routed through the same pull boxes located outside of the DCPD protected area. The circuits routed through these pull boxes contain ASW 2-1 and 2-2 pump motor and exhaust fan E-102 and E-104 power cables, as well as ASW control cables. Each redundant set of cables is located in one half of the pull box separated by a 2 inch thick transite dividing panel. Each pull box is approximately 6 feet long, 5 1/2 feet wide, and 8 feet deep with the transite panel separating the pull boxes into compartments (See Figure 1). The electrical separation transite panel extends from side to side into the wall from the base of the box to within 12 inches of the pull box lid for BPO 33, and 8 inches from the pull box lid for BPO 43. The pull boxes contain a drainage gutter that penetrates both halves of the pull box and the two adjacent pull boxes. The pull box is separated from the two adjacent pull boxes by a 6 inch



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concrete wall (3-hour rated fire barrier). The entire pull box is then provided with a 6 inch thick concrete lid which covers the entire opening.

Unit 1 was also evaluated as embedded in the 10 CFR 50, Appendix R, analysis. Electrical engineering reviewed or examined various Unit 1 ASW pull boxes, and a preliminary review has determined that this condition is not applicable to Unit 1 because the redundant cables are routed through entirely separate pull boxes.

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

None.

E. Dates and Approximate Times for Major Occurrences

- | | |
|--|--|
| <p>1. October 17, 1997, at 1630 PDT:</p> <p>2. October 17, 1997, at 1630 PDT:</p> <p>3. October 17, 1997, at 1657 PDT:</p> | <p>Event/discovery date: PG&E determined that there was inadequate separation to comply with 10 CFR 50, Appendix R, requirements.</p> <p>A continuous firewatch was established.</p> <p>A one-hour, non-emergency report was made to the NRC in accordance with 10 CFR 50.72(b)(1)(ii)(B).</p> |
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F. Other Systems or Secondary Functions Affected

None.

G. Method of Discovery

Utility personnel, performing a design review of the tornado missile potential of hatch covers, identified the problem.



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H. Operator Actions

None.

I. Safety System Responses

None.

III. Cause of the Problem

A. Immediate Cause

Two ASW circuits do not meet the requirements of 10 CFR 50, Appendix R.

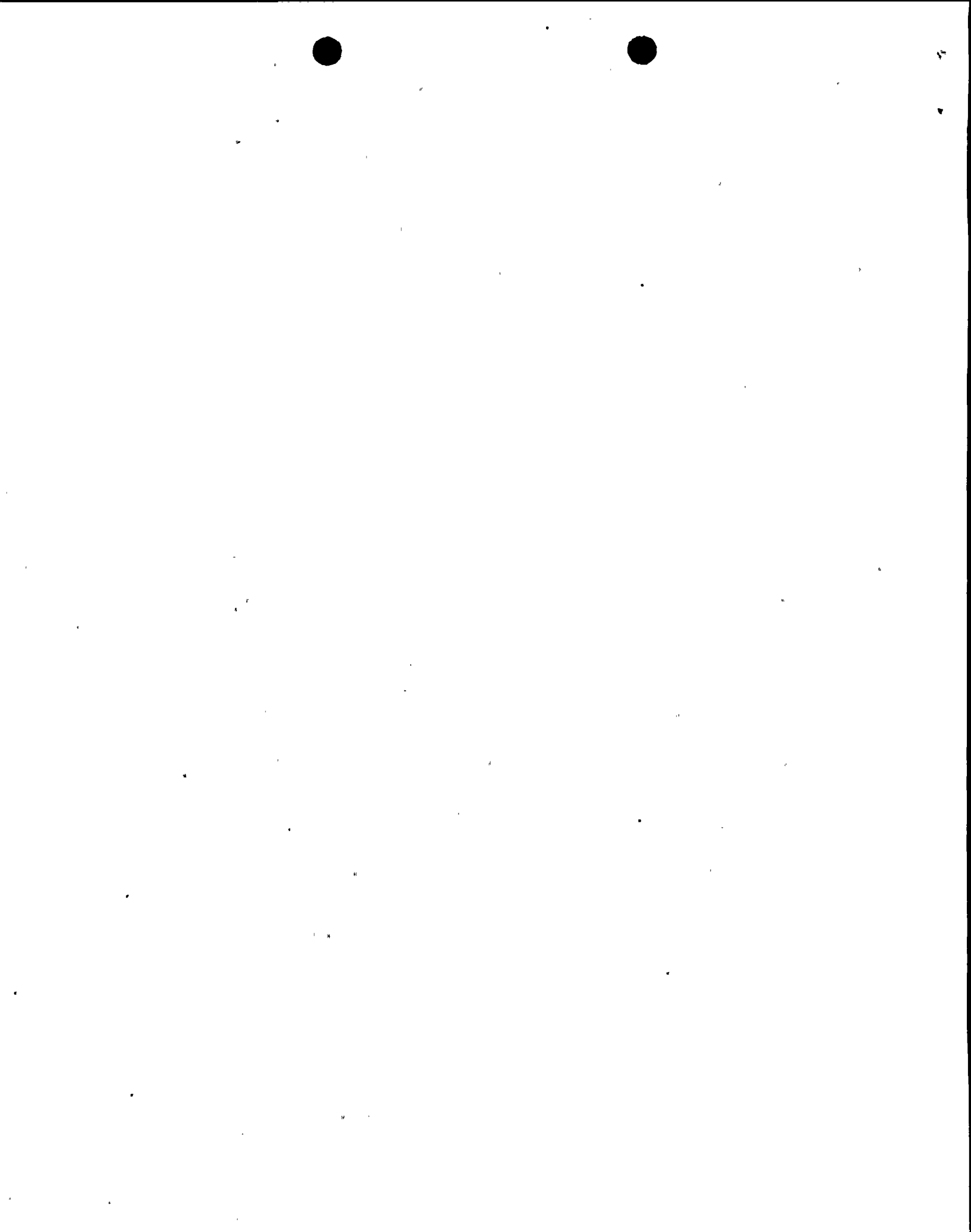
B. Root Cause

The root cause for this event is personnel error (cognitive) in that PG&E engineering personnel who performed the 10 CFR 50, Appendix R, reviews (1984 Appendix R review and 1991-94 Appendix R reanalysis) believed that the subject ASW conduit and cables were embedded, and therefore did not constitute a configuration that needed installed fire barriers to meet the requirements of 10 CFR 50, Appendix R.

IV. Analysis of the Event

The only combustible material contained in the pull boxes is cable jacketing. The only credible ignition source in the pull box is autoignition of cable jacketing due to an electrical fault. PG&E fuse and breaker coordination are designed and installed to automatically detect ASW circuit faults. Therefore, electrical faults would be rapidly detected and cleared. Given that circuit protection equipment operates, and all faults are cleared, it is highly improbable that a current of sufficient magnitude would occur to cause heating and subsequent autoignition of the cable jacketing. Nor is it likely that cable failure would occur at this point. No other ignition sources exist in the pull box enclosures.

The combustible loading for BPO 33 and 43 and adjacent pull boxes have been evaluated and equated to a fire duration of less than 15 minutes. If a fire, 15 minutes in duration, was postulated on one side of the subject pull boxes, the concrete and transite panels would be subjected to radiant heat from burning insulation on the cables located within the pull boxes. No other combustible



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material is contained in the pull boxes. Due to the limited amounts of cable insulation material, and given that the cable insulation is generally very slow burning, the amount of radiant heat emitted from a fire would be inconsequential and would have a very small impact on the transite panel. In addition, given the limited combustible loading and the thermal heat sink of the concrete pull box, the internal temperatures in the pull box would be limited. With a fire inside the pull boxes, smoke and hot gases would tend to rise upward and out of unsealed openings at the interface of the pull box and the concrete lid rather than ignite the cables in the other half of the pull box. Therefore, the transite panel would be expected to adequately prevent the spread of fire from one compartment to the other.

In the unlikely event that both Unit 2 trains of ASW pump power supplies were damaged by fire, Unit 2 ASW can be supplied from a Unit 1 ASW pump via a crossie connection (Ref. Abnormal Operating Procedure OP AP-10, "Loss of Auxiliary Saltwater;" and OP SD-3, "Loss of Auxiliary Saltwater;" for Modes 5 and 6).

Additionally, PG&E has completed an analysis demonstrating the plant can be safely shut down with no ASW available. PG&E evaluated plant operation without the use of ASW components as part of PG&E's response regarding the impact of malevolent use of vehicles on-site. The analysis was contained in PG&E Letter DCL-95-046, "Response to 10 CFR 73.55. Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors Against Radiological Sabotage," submitted to the NRC on February 28, 1995.

In summary, the ASW cables have operable overcurrent circuit fault protection; the combustible loading of the pull boxes is insufficient to support a large fire; and although the transite panels are not fire rated, there is reasonable assurance that they would provide some degree of fire protection. Therefore, PG&E believes that the safe shutdown circuits were adequately protected. Finally, DCCP Unit 2 can be supplied with ASW from Unit 1 or safely shut down without ASW.

Thus, this event did not adversely affect the health and safety of the public.



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V. Corrective Actions

A. Immediate Corrective Actions

PG&E implemented a continuous firewatch. In addition, the subject pull box lids have been adjusted so that a 4 inch access port is provided to support fire suppression activities. Subsequently, PG&E installed temporary fire and smoke detection equipment and implemented a roving hourly firewatch.

B. Corrective Actions to Prevent Recurrence

1. PG&E will modify both pull boxes, BPOs 33 and 43, to bring them into compliance with 10 CFR 50, Appendix R, requirements.
2. PG&E will review other embedded pull boxes to ensure that all safe shutdown cabling is in compliance with 10 CFR 50, Appendix R.

VI. Additional Information

A. Failed Components

None.

B. Previous LERs on Similar Problems

1. LER 1-95-003-01 regarding fire barriers outside design basis due to inadequate testing qualification basis: The root cause was personnel error (cognitive) in that PG&E and contract engineering personnel believed that the available fire tests bounded the installed configurations. As corrective actions to prevent recurrence, PG&E inspected the potentially indeterminate fire barriers, and reviewed the adequacy of the qualifications for the materials used in these fire barriers. PG&E also performed additional fire testing. Where necessary, modifications were made to ensure that only qualified fire barriers were used. PG&E issued a case study to engineers to address the lessons learned, and revised applicable design documents. The review performed for fire areas containing safe shutdown equipment did not identify this problem because the pull boxes were never separately evaluated for safe shutdown.



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2. LER 1-94-001-01 regarding fire barrier penetration seals: The root cause of LER 1-94-001-01 was a programmatic deficiency in that the review of documents during development of the penetration seal specifications and design drawings apparently did not include a detailed review of vendor installation procedures and associated fire tests. As the primary corrective action to prevent recurrence, PG&E stated it would establish a program to develop a basis for the qualification of fire barrier penetration seals with respect to qualified fire tests, or commensurate with the hazards. Since the pull boxes are embedded and have no fire barrier penetration seals associated with them, the corrective actions for the LER would not have identified the noncompliance of the pull boxes.



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FIGURE 1

