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FACIL:STN-50-528 Palo Verde Nuclear Station, Unit 1, Arizona Publi 05000528  
AUTH.NAME AUTHOR AFFILIATION  
BRADISH,T.R. Arizona Public Service Co. (formerly Arizona Nuclear Power  
LEVINE,J.M. Arizona Public Service Co. (formerly Arizona Nuclear Power  
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 93-005-00:on 930628,identified that redundant trains of  
safe shutdown equipment could be rendered inoperable by  
single fire.Fire watches manned in any area not already  
under compensatory fire watch.W/930715 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 10  
TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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05000528 A

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JAMES M. LEVINE  
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192-00850-JML/TRB/RJR  
July 15, 1993

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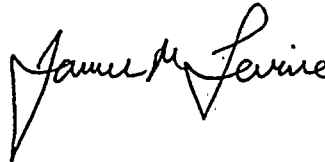
Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Unit 1  
Docket No. STN 50-528 (License No. NPF-41)  
Licensee Event Report 93-005-00  
File: 93-020-404

Attached please find Licensee Event Report (LER) 93-005-00 prepared and submitted pursuant to 10CFR50.73. This LER reports the possible loss of redundant trains of safe shutdown equipment due to a single fire. In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the Regional Administrator, NRC Region V.

If you have any questions, please contact Thomas R. Bradish, Manager, Nuclear Regulatory Affairs, at (602) 393-5421.

Sincerely,



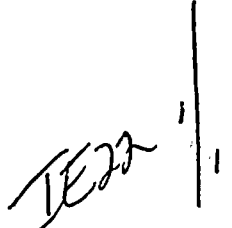
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Attachment

cc: W. F. Conway (all with attachment)  
B. H. Faulkenberry  
J. A. Sloan  
INPO Records Center

260000

9307270179 930715  
PDR ADDCK 05000528  
S PDR





# LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) <b>Palo Verde Unit 1</b>	DOCKET NUMBER (2) <b>0 5 0 0 0 5 2 8</b>	PAGE (3) <b>1 OF 0 9</b>
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TITLE (4)  
**Loss of Redundant Trains of Safe Shutdown Equipment Due to a Single Fire**

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)
									Palo Verde Unit 2		0 5 0 0 0 5 2 9
0 7	2 8	9 2	9 3	0 0 5	0 0	0 7	1 5	9 3	Palo Verde Unit 3		0 5 0 0 0 5 3 0

OPERATING MODE (9) <b>1</b>	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)									
POWER LEVEL (10) <b>1 0 0</b>	<input type="checkbox"/> 20.402(b)			<input type="checkbox"/> 20.405(c)			<input type="checkbox"/> 50.73(a)(2)(v)			<input type="checkbox"/> 73.71(b)
	<input type="checkbox"/> 20.405(a)(1)(i)			<input type="checkbox"/> 50.36(c)(1)			<input type="checkbox"/> 50.73(a)(2)(v)			<input type="checkbox"/> 73.71(c)
	<input type="checkbox"/> 20.405(a)(1)(f)			<input type="checkbox"/> 50.36(c)(2)			<input type="checkbox"/> 50.73(a)(2)(vi)			<input checked="" type="checkbox"/> OTHER (Specify in Abstract below and in Text, NRC Form 366A) <b>Technical Specification 6.9.3</b>
	<input type="checkbox"/> 20.405(a)(1)(f)			<input type="checkbox"/> 50.73(a)(2)(i)			<input type="checkbox"/> 50.73(a)(2)(vi)(A)			
	<input type="checkbox"/> 20.405(a)(1)(iv)			<input type="checkbox"/> 50.73(a)(2)(ii)			<input type="checkbox"/> 50.73(a)(2)(vi)(B)			
<input type="checkbox"/> 20.405(a)(1)(v)			<input type="checkbox"/> 50.73(a)(2)(iii)			<input type="checkbox"/> 50.73(a)(2)(x)				

LICENSEE CONTACT FOR THIS LER (12)									
NAME <b>Thomas R. Bradish, Manager, Nuclear Regulatory Affairs</b>								TELEPHONE NUMBER: <b>6 0 2 3 9 3 - 5 4 2 1</b>	
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)									

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDs	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDs

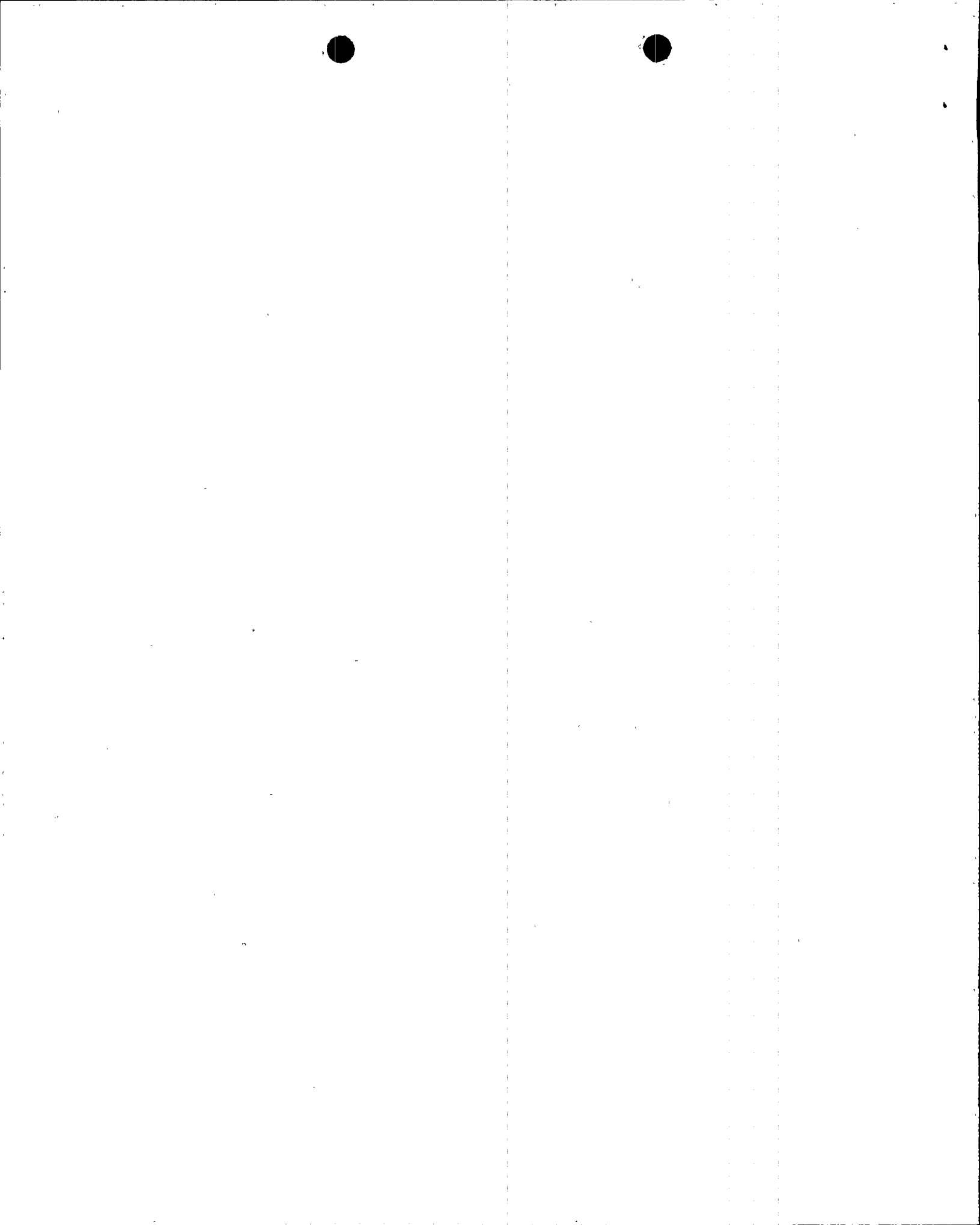
SUPPLEMENTAL REPORT EXPECTED (14)					EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO								

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

At approximately 0745 MST, on July 28, 1992, as a result of the 10CFR50 Appendix R reconstitution project, it was identified that redundant trains of safe shutdown (SSD) equipment could be rendered inoperable by a single fire. This condition was limited to equipment powered from the SSD 125 volt DC ungrounded Class IE power supplies. The initial evaluation which was completed on October 22, 1992, identified 200 pieces of SSD equipment that may be impacted by the condition. Compensatory measures (fire watches) were established in all affected areas/fire zones in the power block.

On June 22, 1993, a final evaluation was completed that identified that 8 pieces of the previously identified equipment would require a design change to provide the necessary electrical protection. Plant Change Request (PCR) 93-13-ZZ-001 was approved by the Plant Modification Committee on June 29, 1993. The implementation of the modification has been scheduled in accordance with PVNGS Long Range Planning and are currently planned for refueling outages 1R5, 2R6, and 3R5.

Previous similar events were reported pursuant to TS 6.9.3 in LERs 528/91-008-01, 528/91-011-00, 528/92-010-00, and 528/92-015-00.



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**I. DESCRIPTION OF WHAT OCCURRED:**

**A. Initial Conditions:**

At approximately 0745 MST on July 28, 1992, Palo Verde Units 1, 2 and 3 were in Mode 1 (POWER OPERATION) operating at approximately 100 percent power.

**B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):**

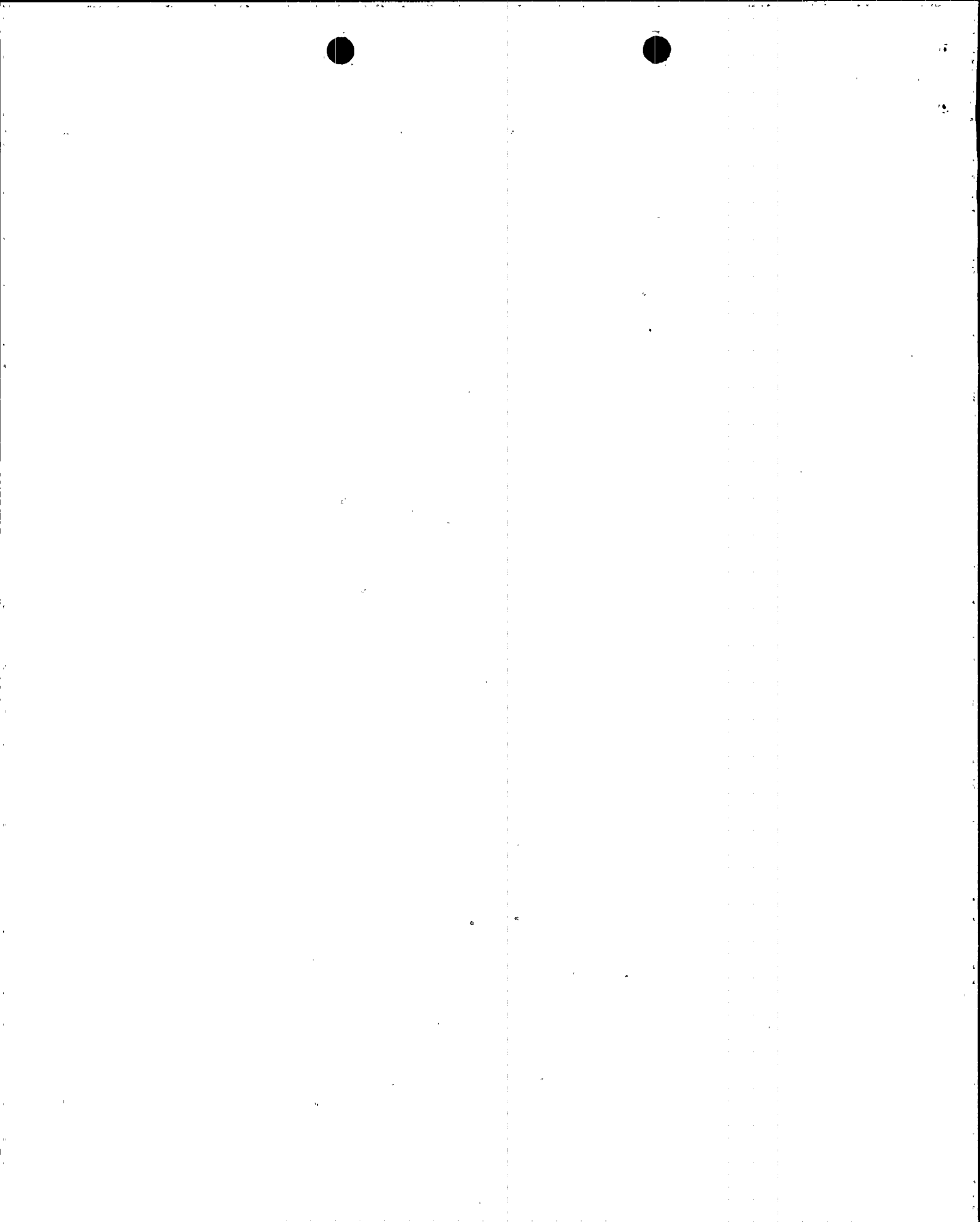
**Event Classification:** Violation of the requirements of the Fire Protection Program which would have adversely affected the ability to achieve and maintain safe shutdown in the event of a fire, Technical Specification (TS) 6.9.3.

At approximately 0745 MST, on July 28, 1992, as a result of the 10CFR50 Appendix R reconstitution project, APS Fire Protection (FP) Engineering personnel (utility, non-licensed) identified that redundant trains of safe shutdown (SSD) equipment could be rendered inoperable by a single fire. This condition was limited to equipment powered from the SSD 125 volt DC ungrounded Class IE power supplies where circuits of non-SSD equipment (associated circuits):

- have only one circuit leg electrically protected by coordinated relays, fuses, or circuit breakers,
- are powered from the same power supply as SSD equipment, and
- have not been verified to meet the requirements of 10CFR50 Appendix R Section III.G.2 and 3.

It was postulated that a fire induced fault in an associated circuit would cause current flow in the unfused leg. This current could trip the common power supply breaker causing a loss of power to the SSD load. Section V, "Additional Information" Figure 1 illustrates this condition.

Prior to identifying this condition, APS FP Engineering personnel had initiated a 10CFR50 Appendix R reconstitution project. This consisted of an in-depth review of the existing SSD analysis. As part of that effort, a review of calculations, elementary diagrams, loop diagrams, and vendor documents identified several pieces of SSD equipment that could be affected by the described condition. The cable routing of associated circuits was not





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FACILITY NAME  Palo Verde Unit 1	DOCKET NUMBER  0500052893	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3">LER NUMBER</th> </tr> <tr> <th style="width: 33%;">YEAR</th> <th style="width: 33%;">SEQUENTIAL NUMBER</th> <th style="width: 33%;">REVISION NUMBER</th> </tr> <tr> <td>93</td> <td>005</td> <td>00</td> </tr> </table>	LER NUMBER			YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	93	005	00	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2">PAGE</th> </tr> <tr> <td style="width: 50%;">03</td> <td style="width: 50%;">OF 09</td> </tr> </table>	PAGE		03	OF 09
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TEXT

reviewed as part of the original Appendix R analysis. Therefore, some circuits of SSD equipment may not be fully isolated from faults on associated circuits as required by 10CFR50 Appendix R.

On October 22, 1992, the initial evaluation of the condition was completed. That evaluation identified 200 pieces of SSD equipment that may be impacted by the condition. Upon discovery, compensatory measures (fire watches) were established in all affected areas/fire zones in the power block. Additional fire impairment logs were initiated for any fire zone containing the identified equipment circuitry that was not already under an impairment. These compensatory measures will remain in effect until necessary operator actions have been incorporated into the Control Room Fire procedure, the Pre-Fire Strategies Manual, and/or a Plant design Change has been implemented.

Once the SSD equipment and associated circuits were identified, they were evaluated for impacting:

- a fire inside the Control Room, and
- a fire outside the Control Room.

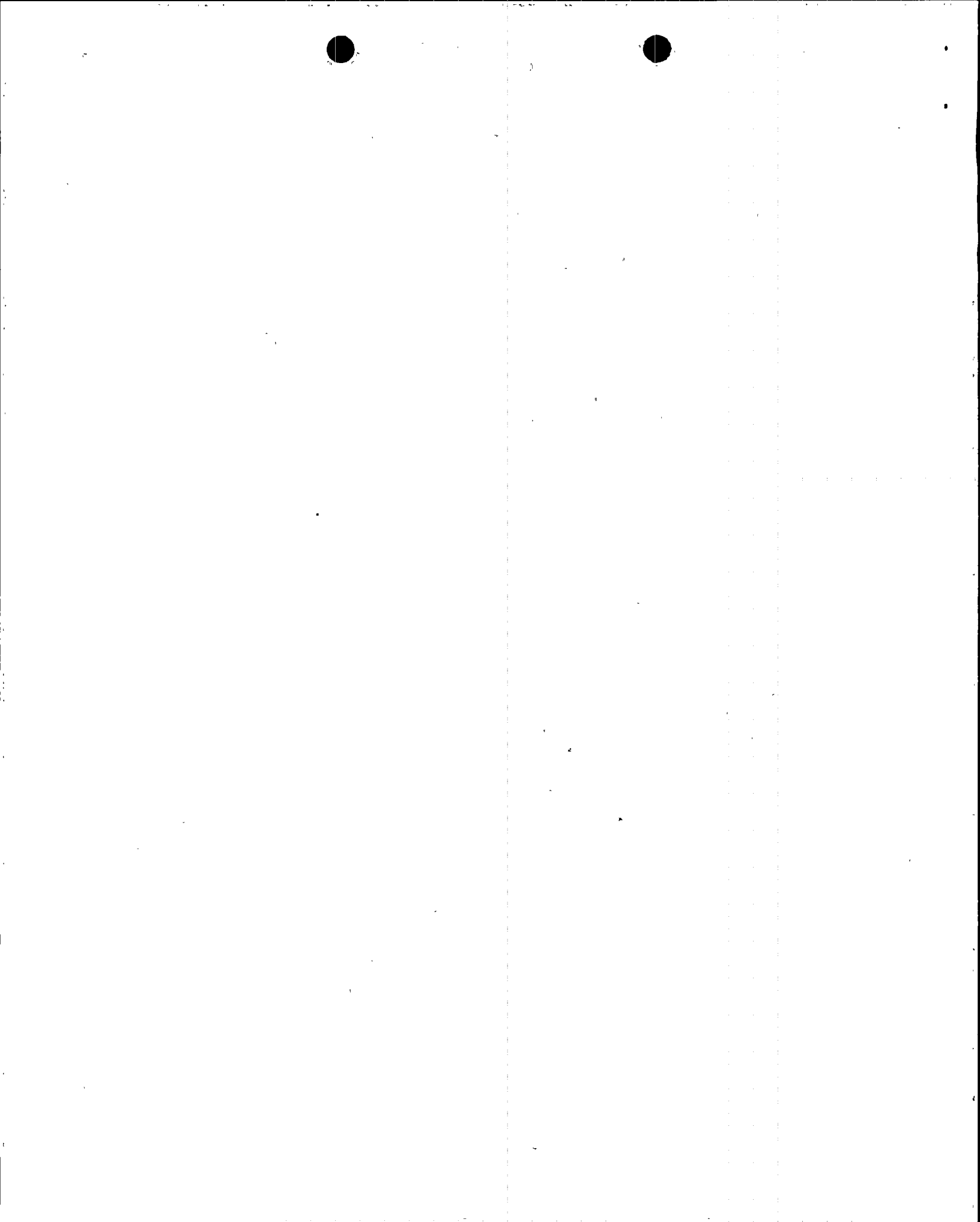
If the equipment's ability to function and support SSD was impacted, then the evaluation expanded to consider:

- existing operator action(s) that would mitigate the concern, and
- any time constraints involved.

Based on this review, additional compensatory measures beyond the initial fire watch were developed and implemented. These measures consisted of:

- revising the Control Room Fire procedure to isolate the faulted equipment and return power to the SSD equipment,
- developing hot shutdown repairs, and/or
- developing a design change to permanently correct the condition.

On June 22, 1993, a final evaluation was completed by FP Engineering. This final evaluation identified that 8 pieces of the previously identified equipment would require a design change to provide the necessary electrical protection. The remaining pieces of equipment were determined to either: not impact SSD in



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the event of a fire, or the consequences of a fire could be mitigated by operator actions. This evaluation was reviewed by Nuclear Regulatory Affairs personnel (utility, non-licensed) on June 24, 1993, at approximately 1330 MST, and determined to be reportable.

- C. Status of structures, systems, or components that were inoperable at the start of the event that contributed to the event:

Not applicable - no structures, systems, or components were inoperable at the start of the event which contributed to this event.

- D. Cause of each component or system failure, if known:

Not applicable - no component or system failures were involved.

- E. Failure mode, mechanism, and effect of each failed component, if known:

Not applicable - no component failures were involved.

- F. For failures of components with multiple functions, list of systems or secondary functions that were also affected:

Not applicable - no failures of components with multiple functions were involved.

- G. For a failure that rendered a train of a safety system inoperable, estimated time elapsed from the discovery of the failure until the train was returned to service:

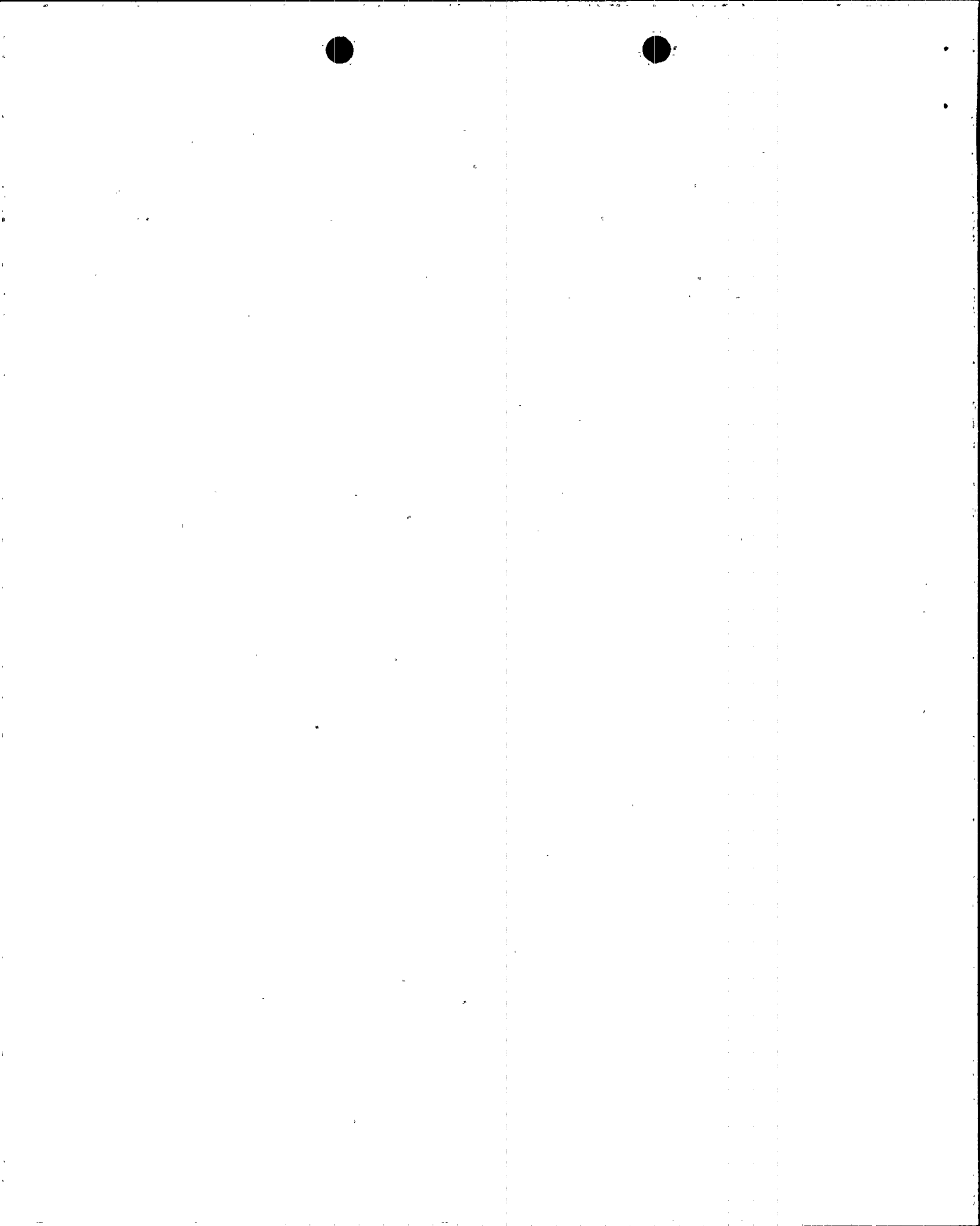
Not applicable - no failures that rendered a train of a safety system inoperable were involved.

- H. Method of discovery of each component or system failure or procedural error:

There have been no component or system failures, or procedural errors identified. However, as described in Section I.B, the condition was discovered by APS FP Engineering personnel during the performance of a full scope 10CFR50 Appendix R reconstitution project.

- I. Cause of Event:

During mid-1984, prior to licensing Unit 1, Combustion Engineering, Bechtel, and APS personnel (utility and contractor,



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non-licensed) evaluated and identified equipment necessary to shut down the plant safely during postulated fires. This included a comprehensive study of the SSD circuits and equipment. However, the original analysis failed to identify the potentially unprotected condition of several SSD and associated circuits (SALP Cause Code A: Personnel Error).

No unusual characteristics of the work location (e.g., noise, heat, poor lighting) directly contributed to this event. No procedural errors have been identified which contributed to this event.

**J.    Safety System Response:**

Not applicable - there were no safety system responses and none were necessary.

**K.    Failed Component Information:**

Not applicable - no component failures were involved.

**II.   ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS EVENT:**

The PVNGS Fire Protection Program assures that SSD can be achieved and maintained in the event of a fire. For a fire in the Control Room, procedures are in place and fire protection features are designed to use selected Train B components for SSD activities. For fires outside the Control Room, a Pre-fire Strategies Manual has been developed to provide recommended actions necessary for SSD.

Upon discovery of the potential condition, fire watches were immediately established for all fire zones within the power block where cables from both trains of SSD equipment and associated circuits were routed. During a detailed review, additional compensatory measures were developed and implemented. For a majority of the equipment identified as being impacted by the condition identified in this LER, no compensatory action was required. This is because the equipment either failed in the position required for SSD or operator actions had already been implemented that provided mitigating actions.

Section V, Additional Information, Attachment 1, contains a list of equipment that, although compensatory actions are in place, require a plant modification as final corrective action. Without this SSD equipment, the ability to achieve and maintain SSD may be adversely affected. Permanent corrective actions to provide the required electrical protection have been developed for all identified equipment.



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## III. CORRECTIVE ACTION:

### A. Immediate:

Upon discovery of the potential condition, fire watches were manned in any area not already under a compensatory fire watch.

The Pre-Fire Strategies Manual has been updated and spare fuses have been staged for use in returning circuits to services during a fire until permanent design changes can be approved and implemented.

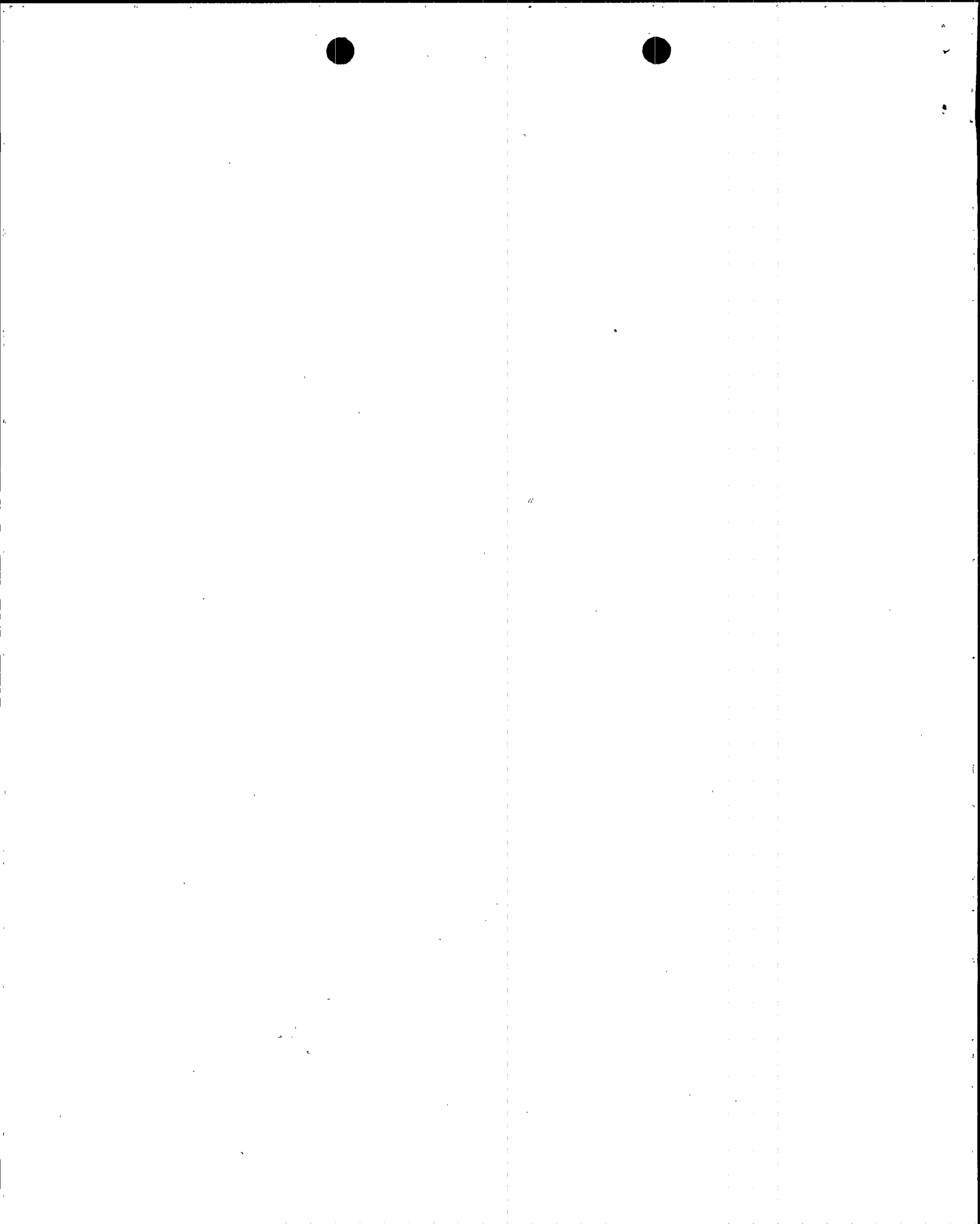
The Control Room Fire procedure has been revised to provide direction for isolating faulted circuits and returning undamaged SSD equipment to service.

### B. Action to Prevent Recurrence:

Final corrective actions consists of a Plant Change Request to provide additional fusing in circuits with an unprotected leg. Plant Change Request (PCR) 93-13-ZZ-001 was approved by the Plant Modification Committee on June 29, 1993. The implementation of the modification has been scheduled in accordance with PVNGS Long Range Planning and is currently planned for refueling outages 1R5, 2R6, and 3R5.

## IV. PREVIOUS SIMILAR EVENTS:

Previous similar events were reported pursuant to TS 6.9.3 in LERs 528/91-008-01, 528/91-011-00, 528/92-010-00, and 528/92-015-00. These LERs were all a result of the 10CFR50 Appendix R reconstitution project. LER 528/91-008-01 addressed a postulated fire in the Control Room affecting reactor coolant pump seal (AB) integrity and excessive reactor coolant system leakage. LER 528/91-011-00 addressed a postulated fire in the Control Room which could result in a loss of cooling to the Train B Engineered Safety Features (ESF) switchgear (SWGR) room, the D.C. equipment room, and the battery (BTRY) room on the 100 foot elevation of the Control Building (NA). LER 528/92-010-00 addressed a postulated fire in the Corridor Building that could result in the loss of cooling to both trains of SSD equipment or that a postulated fire in the Train B ESF Switchgear room or Train B Battery room could result in a loss of cooling to Train A SSD equipment. LER 528/92-015-00 addressed a postulated fire in the Main Steam Support Structure (MSSS)(NM), concurrent with a loss of off-site power, which could result in a short in an unprotected control circuit cable of the Essential Air Cooling Unit (ACU)(VF) to the redundant train of SSD equipment. The corrective actions taken for these events were specific to the postulated scenarios and would not be expected to prevent subsequent events.



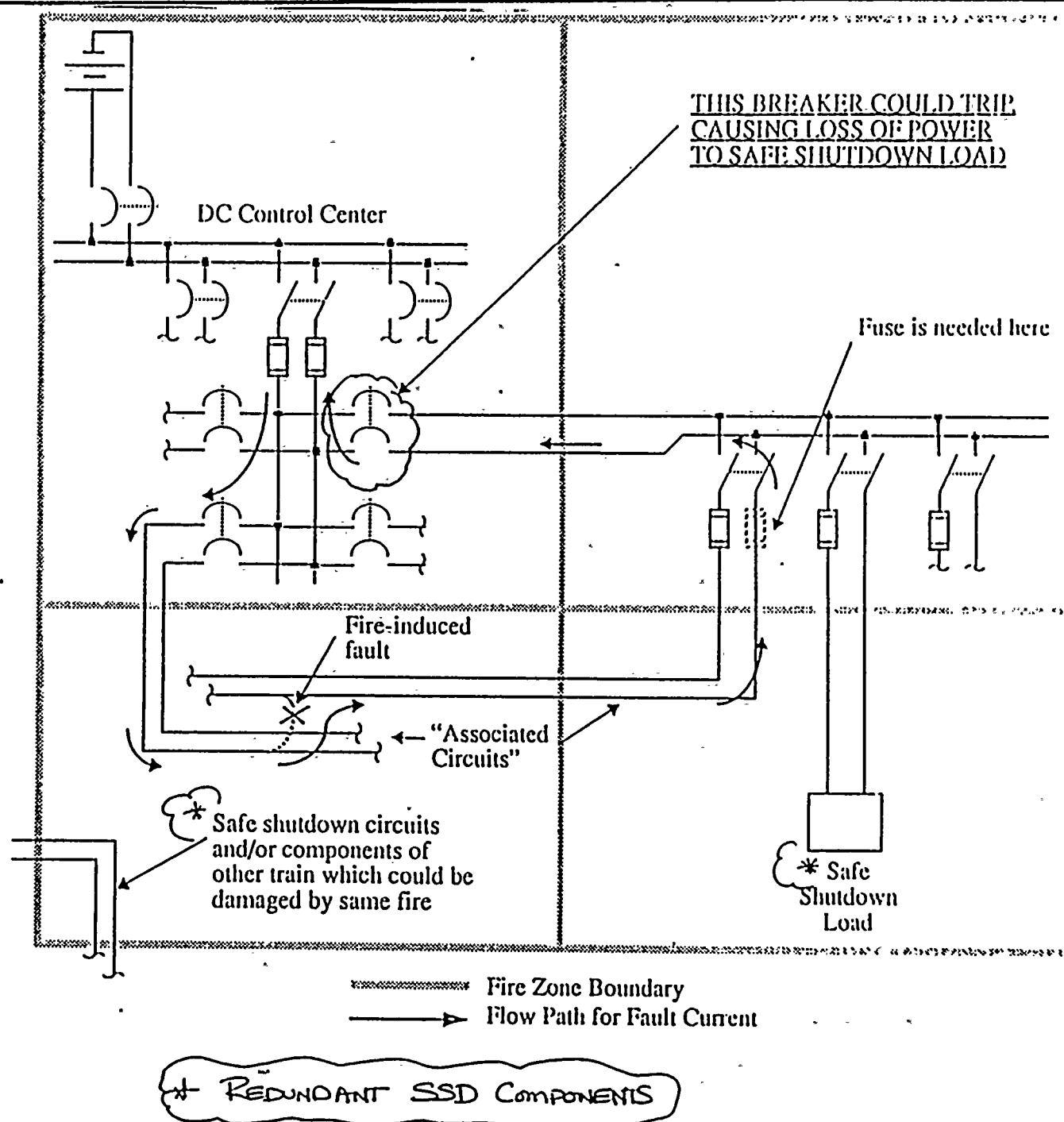


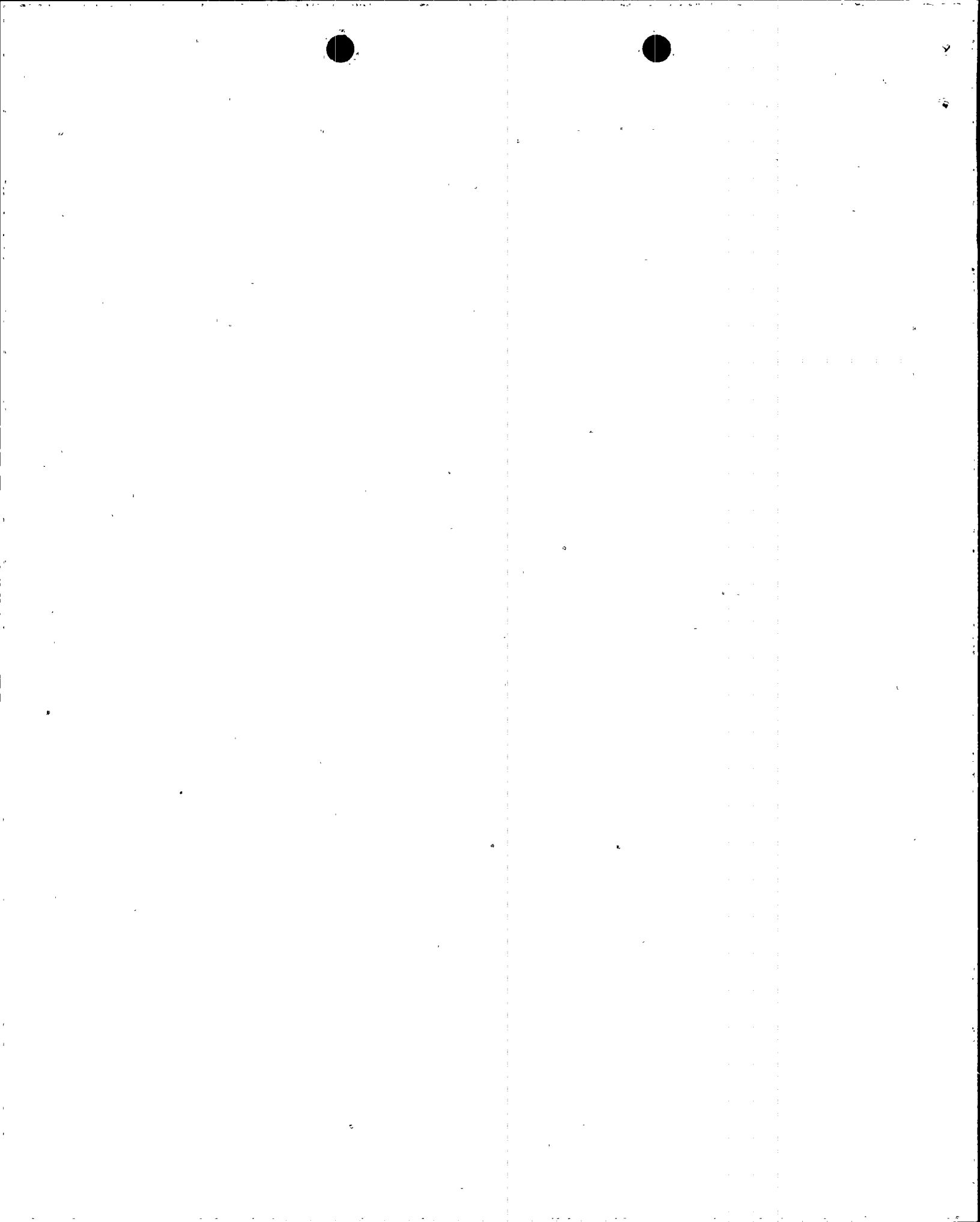
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## V. ADDITIONAL INFORMATION:

Figure 1





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## Attachment 1 Page 1 of 2 Train A Components

### COMPONENT

### DESCRIPTION

J-SSA-UV-203

Hot Leg Loop 1 Sample Containment Isolation Valve

A loss of power to this component will cause it to fail closed. This is the initial required position of this valve. However, sampling may be required and would require manual operator action to restore valve control.

J-SGA-UV-175

Downcomer Feedwater Isolation Valve

A loss of power will cause this valve to fail open. The SSD position for this valve is closed and requires manual operator action to close the valve or stop the Main Feedwater pumps, Condensate pumps, and Heater Drain pumps.

J-CHA-HV-205

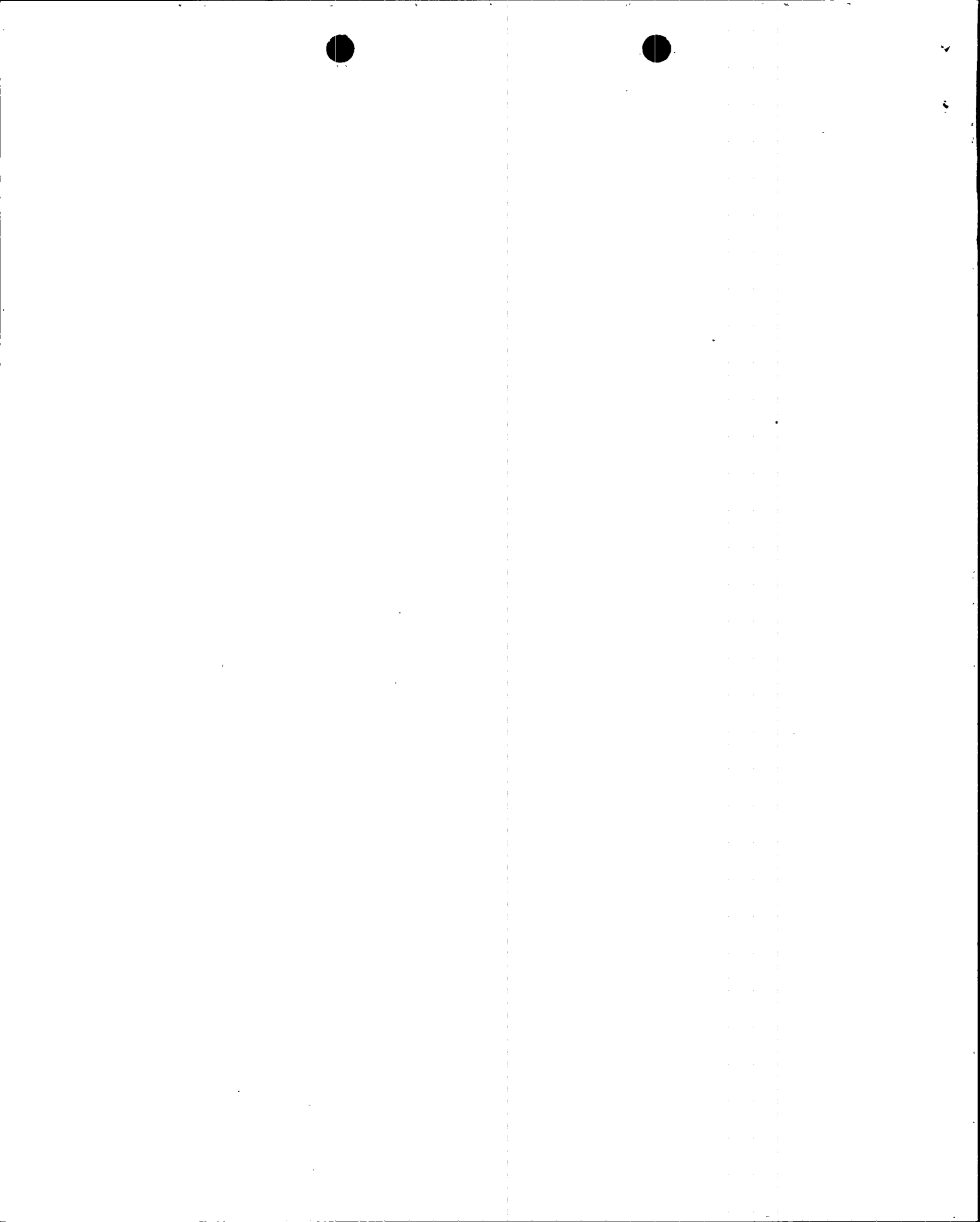
Pressurizer Auxiliary Spray Valve

A loss of power will cause this valve to fail closed. However, this valve may be required for positive pressurizer control and would require manual operator action to restore valve control.

J-RCA-HV-101

Reactor Coolant Vent Valve

A loss of power will cause this valve to fail closed. However, this valve may be required as a reactor head vent path and as a letdown flow path if normal letdown is not available and would require manual operator action to restore valve control.



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## Attachment 1 Page 2 of 2 Train B Components

### COMPONENT

### DESCRIPTION

J-SSB-UV-200

Hot Leg Loop 1 Sample Containment Isolation Valve

A loss of power to this component will cause it to fail closed. This is the initial required position of this valve. However, sampling may be required and would require manual operator action to restore valve control.

J-SGB-UV-135

Downcomer Feedwater Isolation Valve

A loss of power will cause this valve to fail open. The SSD position for this valve is closed and would require manual operator action to close the valve or stop the Main Feedwater pump, Condensate pump, and Heater Drain pump.

J-CHB-HV-203

Pressurizer Auxiliary Spry Valve

A loss of power will cause this valve to fail closed. However, this valve may be required for positive pressurizer control and would require manual operator action to restore valve control.

J-RCB-HV-102

Reactor Coolant Vent Valve

A loss of power will cause this valve to fail closed. However, this valve may be required as a reactor head vent path and as a letdown flow path if normal letdown is not available and would require manual operator action to restore valve control.

