

NIAGARA MOHAWK POWER CORPORATION

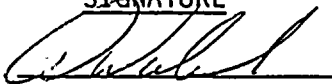
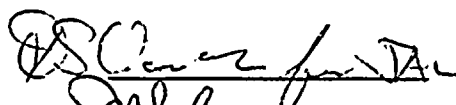
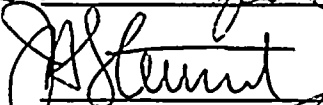
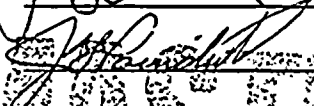
NINE MILE POINT NUCLEAR STATION

UNIT II OPERATIONS

02-REQ-002-309-2-05 Revision 0

07-191-91

TITLE: EMERGENCY CORE COOLING SYSTEMS - INTERLOCK REVIEW

	<u>SIGNATURE</u>	<u>DATE</u>
PREPARER		<u>2/4/90</u>
TRAINING SUPPORT SUPERVISOR		<u>2-5-90</u>
TRAINING AREA SUPERVISOR		<u>2/5/90</u>
PLANT SUPERVISOR/ USER GROUP SUPERVISOR		<u>2/5/90</u>

**MASTER**

Summary of Pages

Effective Date:	<u>2/5/90</u>
Number of Pages:	<u>13</u>

**CONTROLLED DOCUMENT**

Date	Pages
February 1990	13

TRAINING DEPARTMENT RECORDS ADMINISTRATION ONLY:

VERIFICATION: \_\_\_\_\_

DATA ENTRY: \_\_\_\_\_

RECORDS: \_\_\_\_\_

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PDR ADDCK 05000410  
S PDR





I. TRAINING DESCRIPTION

- A. Title of Lesson: ECCS Interlock Review
- B. Lesson Description: Provide a review for licensed operators of ECCS interlocks.
- C. Estimate of the Duration of the Lesson: 1 hours
- D. Method of Evaluation, Grade Format, and Standard of Evaluation:  
Open reference written exam  $\geq$  80%.
- E. Method and Setting of Instruction: Classroom Lecture
- F. Prerequisites:
  - 1. Instructor:
    - a. Instructors shall be qualified for the material being delivered in accordance with NTP-16, Rev. 3, Attachment A.
    - b. Qualified in instructional skills as certified by NTP-16.
  - 2. Trainee:
    - a. Meet eligibility requirements per 10CFR55, or
    - b. Be recommended for this training by the Operations Superintendent or his designee or the Training Superintendent.
- G. References
  - 1. N2-OP-31, Residual Heat Removal System
  - 2. RHS ESK's
  - 3. GE807E170TY RHR Elementary
  - 4. N2-OP-32, Low Pressure Core Spray
  - 5. CSL ESK's
  - 6. GE807E171TY LPCS Elementary
  - 7. N2-OP-33, HPCS
  - 8. CSH ESK's
  - 9. GE807E172TY, HPCS Elementary
  - 10. N2-OP-35, RCIC
  - 11. ICS ESK's
  - 12. GE807173TY RCIC Elementary



II. REQUIREMENTS

- A. AP-9, "Administration of Training"
- B. NTP-11, "Licensed Operator Retraining and Continuing Training"

III. TRAINING MATERIALS

- A. Instructor Materials:
  - 1. Copy of this Lesson Plan
  - 2. Transparency package
  - 3. Overhead projector
- B. Trainee:
  - 1. Interlock Handout

IV. EXAM AND MASTER ANSWER KEYS

- A. Exam and master answer key(s) filed with the official records.



V. LEARNING OBJECTIVES

A. Terminal Objectives

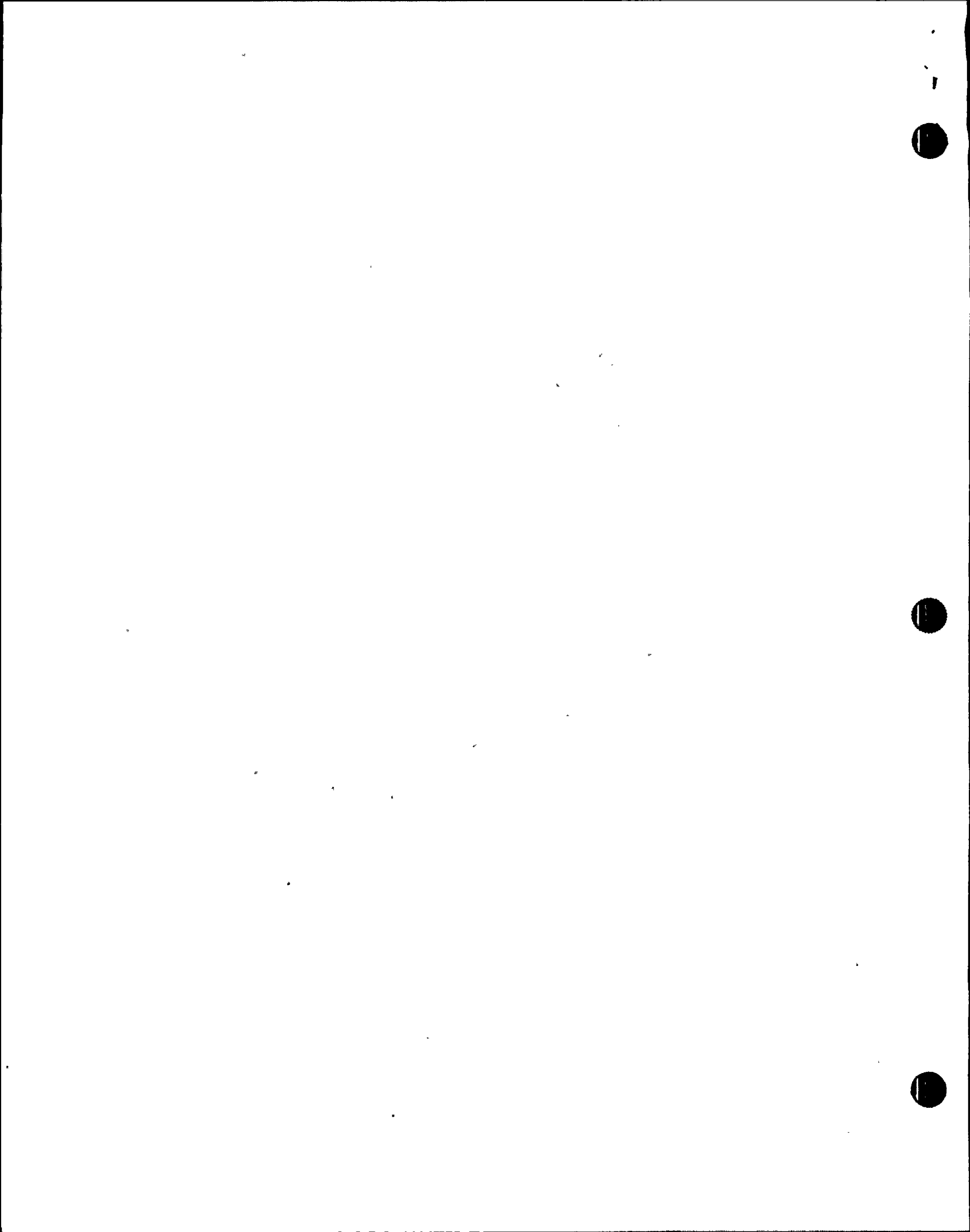
- TO-1.0 2030020101 Place the LPCI system in standby readiness.
- TO-2.0 2050150101 Operate the containment spray system.
- TO-3.0 2059300101 Startup the steam condensing mode of the RHR system.-- .
- TO-4.0 2060030101 Return the HPCS system to standby after an initiation.
- TO-5.0 2060050101 Manually initiate HPCS from the control room.
- TO-6.0 2090040101 Monitor the automatic operation of the LPCS System from the control room.
- TO-7.0 2090050101 Shutdown the LPCS system to standby from the control room following automatic operation.
- TO-8.0 2170030101 Manually initiate the RCIC system from the control room.
- TO-9.0 2179060101 Manually isolate the RCIC system from the control room.
- TO-10.0 2179140101 Operate the RCIC system following an automatic initiation.





B. Enabling Objectives

- EO-1 Describe the HPCS System response to an initiation signal.
- EO-2 State the interlocks for the following HPCS System valves:
- a. Injective valve, MOV-107
  - b. Test return to CST valves, MOV-110 and 112
  - c. Test return to suppression pool, MOV-111
  - d. CST Suction valve, MOV-101
  - e. Suppression pool suction valve, MOV-118
  - f. Minimum flow valve, MOV-105
- EO-3 Describe the RCIC System response to an initiation signal.
- EO-4 State the interlocks for the following RCIC System valves:
- a. Injection valve, MOV-126
  - b. Test return to CST, MOV-124 and FV-108
  - c. CST Suction valve, MOV-129
  - d. Suppression pool suction valve, MOV-136
  - e. Steam admission valve, MOV-120
  - f. Steam admission bypass valve, MOV-159
- EO-5 Describe the LPCS System response to an initiation signal.
- EO-6 State the interlocks for the following LPCS System valves:
- a. Injection valve, MOV-104
  - b. Test return to suppression pool, FV-114
  - c. Minimum flow valve, MOV-107
- EO-7 Describe the RHR System response to an initiation signal.
- EO-8 State the interlocks for the following RHR system valves:
- a. Injection valve, MOV-24
  - b. Test return valve, FV-38
  - c. Suppression pool spray valve, MOV-33
  - d. Drywell spray valves, MOV-15 and MOV-25
  - e. Steam condensing mode valves
  - f. Minimum flow valve, MOV-4
  - g. Shutdown cooling suction, MOV-2
  - h. Suppression pool suction, MOV-1
- EO-9 State the interlocks associated with the RHR pumps.



I. INTRODUCTION

- A. Greet class
- B. Review Learning Objectives
- C. Overview

Complete required paperwork

Show T.P. of objectives

This training is a review of the interlocks associated with the following ECCS Systems.

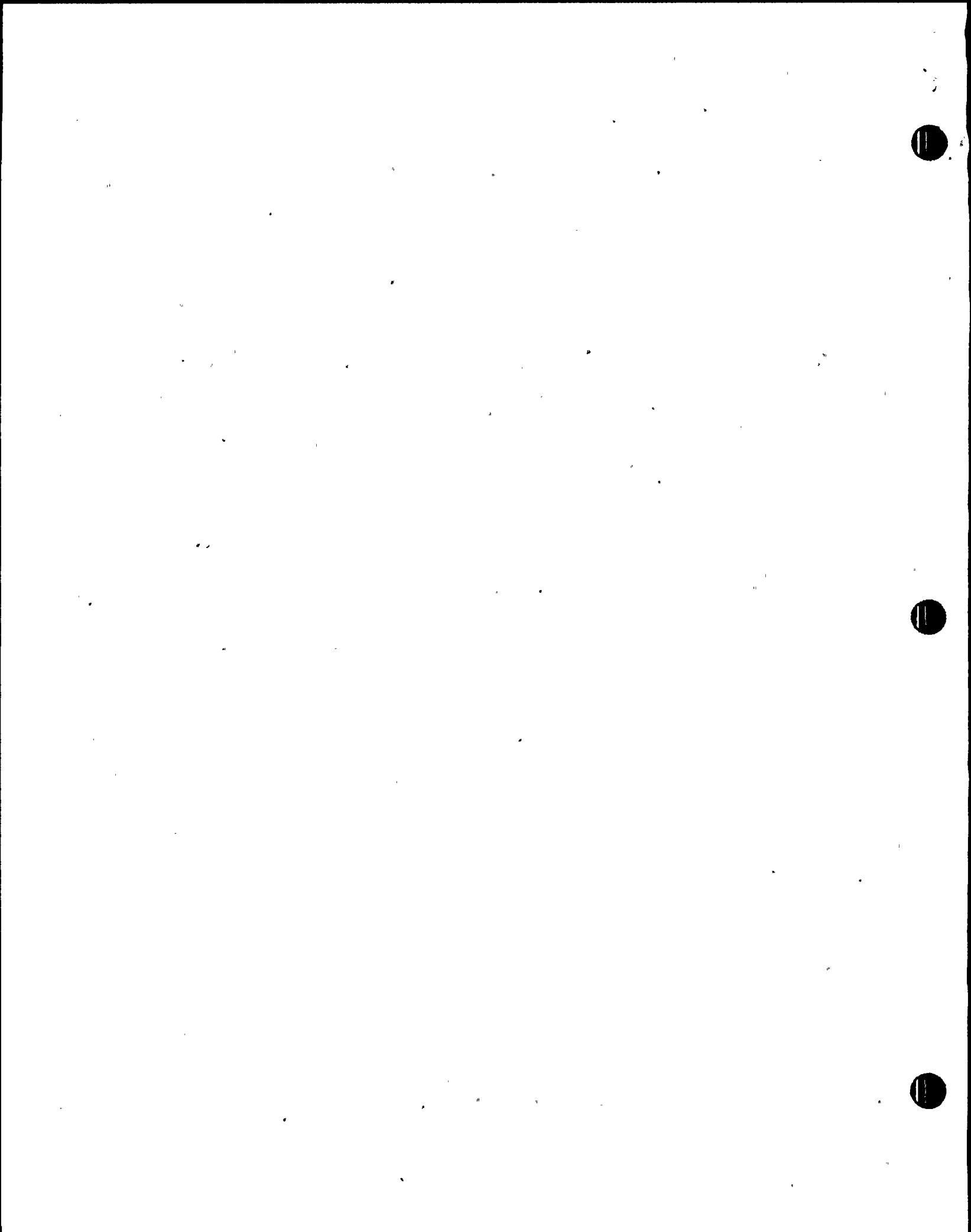
- 1. HPCS
- 2. RCIC
- 3. LPCS
- 4. RHS

II. HIGH PRESSURE CORE SPRAY

- A. Initiation On
  - 1. High Drywell (1.68 psig), Level 2 (108.8 inches) or manually.
- B. Automatic Initiation
  - 1. Div. III DG starts
  - 2. HPCS pump starts
  - 3. HPCS test returns to condensate tank shut, if open (MOV-110/112)
  - 4. Test return to suppression pool shuts if open (MOV-111)
  - 5. Injection valve opens (MOV-107)
  - 6. Min. flow bypass valve (MOV-105) opens if HPCS flow is less than 825 gpm and HPCS system pressure is greater than 240 psig.

Show TP of HPCS System for this discussion

EO-1



## C. MOV-107, HPCS Injection Valve

EO-2a

1. Following automatic initiation the injection valve will auto close at level 8 (202.3 inches) and will reopen at level 2 (108.8 inches)
2. Injection valve can be manually overridden closed provided level is above level 2 and there is an initiation signal present. With the injection valve overridden closed and a return to level 2 the valve will automatically reopen.
3. If the injection valve is overridden closed with an initiation signal present the amber override light will be present.
4. If the high water level trip is reset with an initiation signal sealed in and level is below 202.3 inches, the injection valve will reopen.

Q: What would occur if the high level trip is reset with an initiation signal sealed in.

A: Injection valve would reopen.

NOTE: MOV-110 is normally de-energized Appendix R.

EO-2b

## D. Test return to CST, MOV-110 and MOV-112

1. These valves auto close, if open, on an initiation signal.
2. Auto close (if open) when MOV-118 is opened.

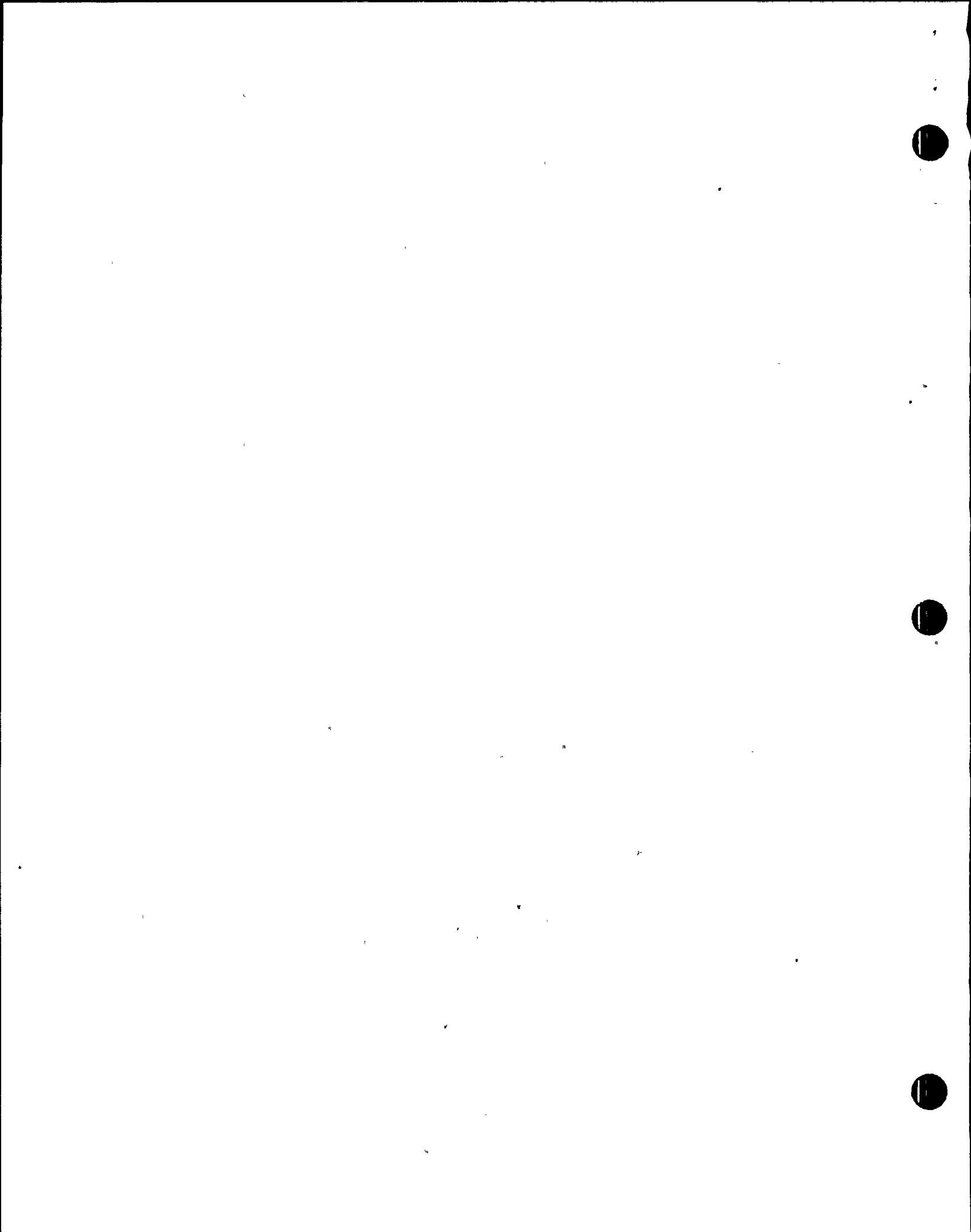
NOTE: Initiation signal must be reset to operate.

NOTE: Initiation signal must be reset to operate.

EO-2c

## E. Test return to suppression pool, MOV-111

1. This valve will auto close, if open, on an initiation signal.



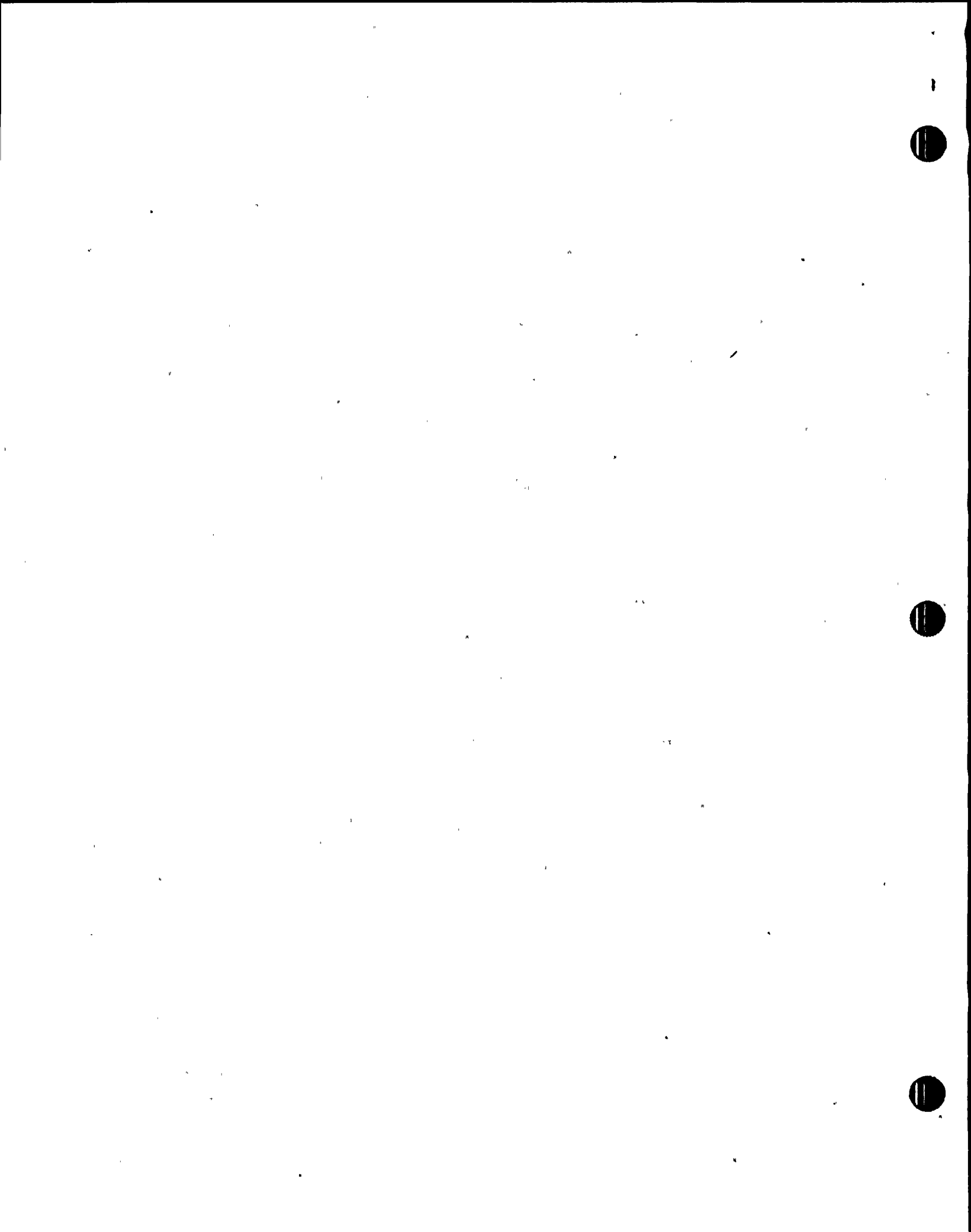
- F. CST suction valve, MOV-101 EO-2d
1. Auto opens on an initiation signal if MOV-118 is closed.
  2. Closes if MOV-118 is opened.
  3. Cannot open unless MOV-118 is closed.
- G. Suppression pool suction valve, MOV-118 EO-2e
1. If open, upon system initiation it remains open. Q: When will MOV-118 automatically open.
  2. To open, MOV-110 and MOV-112 must be shut. A: Low CST level or high suppression pool level.
  3. Auto opens on high suppression pool level (201' Elevation) or low CST level (12.5') provided MOV-110/MOV-112 are shut.
  4. Valve can be overridden shut with a transfer signal present (amber override light)
- H. Min. flow valve, MOV-105 EO-2f
1. Normally closed valve, but will auto open if flow is less than 825 gpm and pump discharge pressure greater than 240 psig.
  2. It will auto closes if flow is greater than 825 gpm or discharge pressure less than 240 psig.

Show TP of RCIC System for this discussion. EO-3

### III. REACTOR CORE ISOLATION COOLING

- A. Initiation on
1. Reactor vessel level 2 (108.8 inches) or manually.

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## B. Automatic initiation the following occur:

1. Gland seal air compressor starts.
2. Turbine lube oil cooling water valve MOV-116 opens.
3. Suction valve from CST opens, if shut.
4. Test returns to CST (FV-108, MOV-124) shut if open.
5. Injection valve (MOV-126) opens after 10 sec. T.D.
6. Steam admission bypass valve (MOV-159) opens and the steam admission valve (MOV-120) opens after 10 sec. T.D.

NOTE: If S.P. suction valve MOV-136 is already open it will stay open.

MOV-159 will close 15 seconds after MOV-120 opens if RPV level > 108.8.

## C. Injection Valve, MOV-126

1. If MOV-150 or MOV-120 close then MOV-126 will close.

NOTE: MOV-120 will auto close at level 8 (208.3 inches) which will close MOV-126.

## D. Test return to CST, MOV-124 and FV-108

1. Will auto close on initiation signal.
2. If the suppression pool suction valve is open the test return valves can be opened, both they will auto close when the control switch is released.

## E. CST suction valve, MOV-129

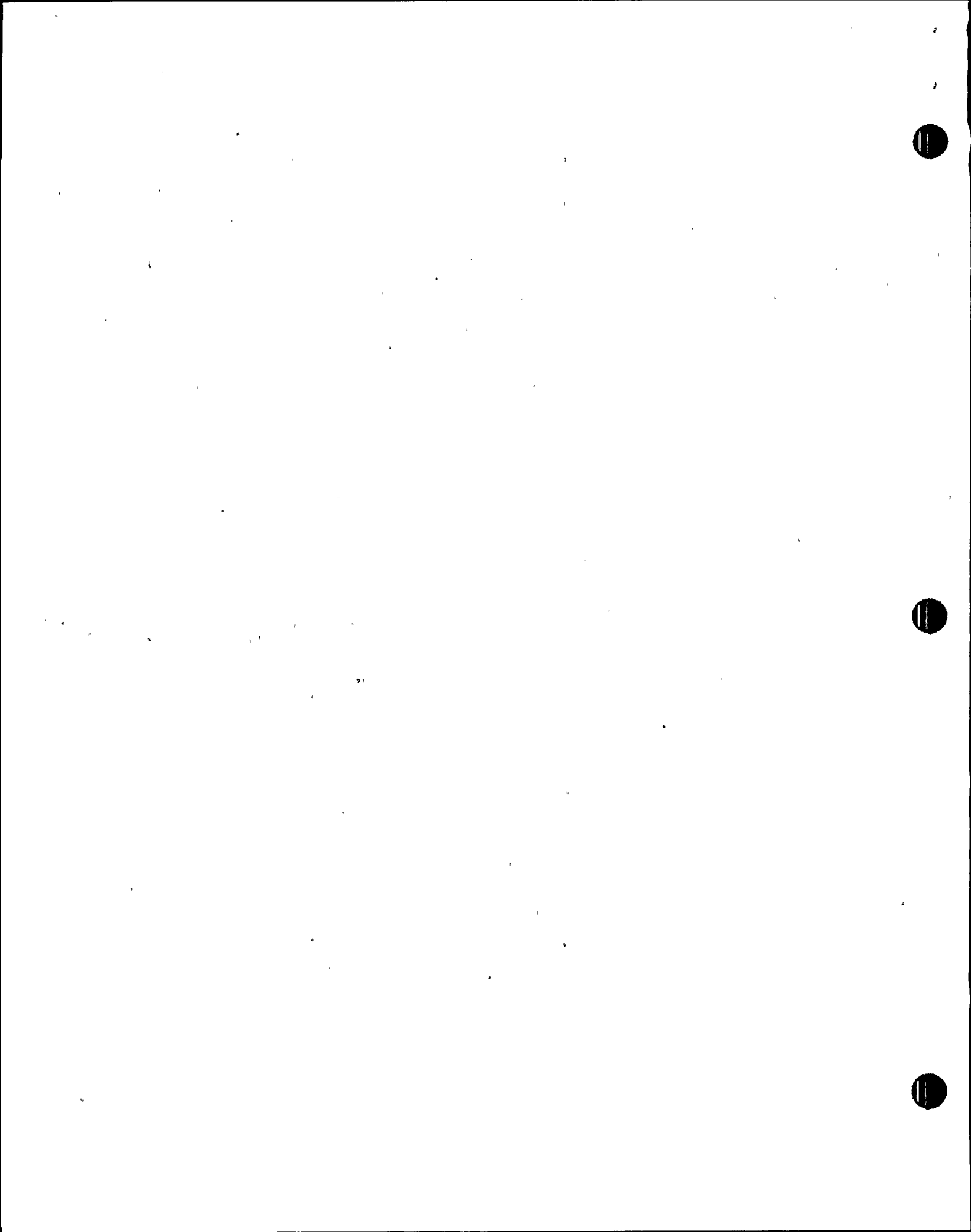
1. Auto closes when suppression pool suction valve (MOV-136) is open.
2. Opens, if shut, on an initiation signal.

NOTE: If MOV-136 is open it will stay open and MOV-129 will remain shut.

EO-4a

EO-4b

EO-4c



## F. Suppression pool suction valve, MOV-136

EO-4d

1. Auto opens on low CST level (6.15 ft).
2. If CST test return valves are open the suppression pool suction valve will not open.

## G. Steam admission valve, MOV-120

EO-4e

1. Will not open unless the steam exhaust valve (MOV-122) is open.
2. Auto closes on level 8 (202.3")
3. If level again drops to level 2 (108.8") the steam admission bypass valve (MOV-159) will open and ten seconds later MOV-120 will open.

## H. Steam admission bypass valve, MOV-159

EO-4f

1. Will not open unless the steam exhaust valve (MOV-122) is open.

## I. Minimum flow valve, MOV-143

1. Opens when flow is less than 110 gpm and pump discharge pressure is above 125 psig.
2. Closes when flow is above 220 gpm.

IV. LOW PRESSURE CORE SPRAY

Show TP of LPCS System for this discussion.

## A. Initiation On

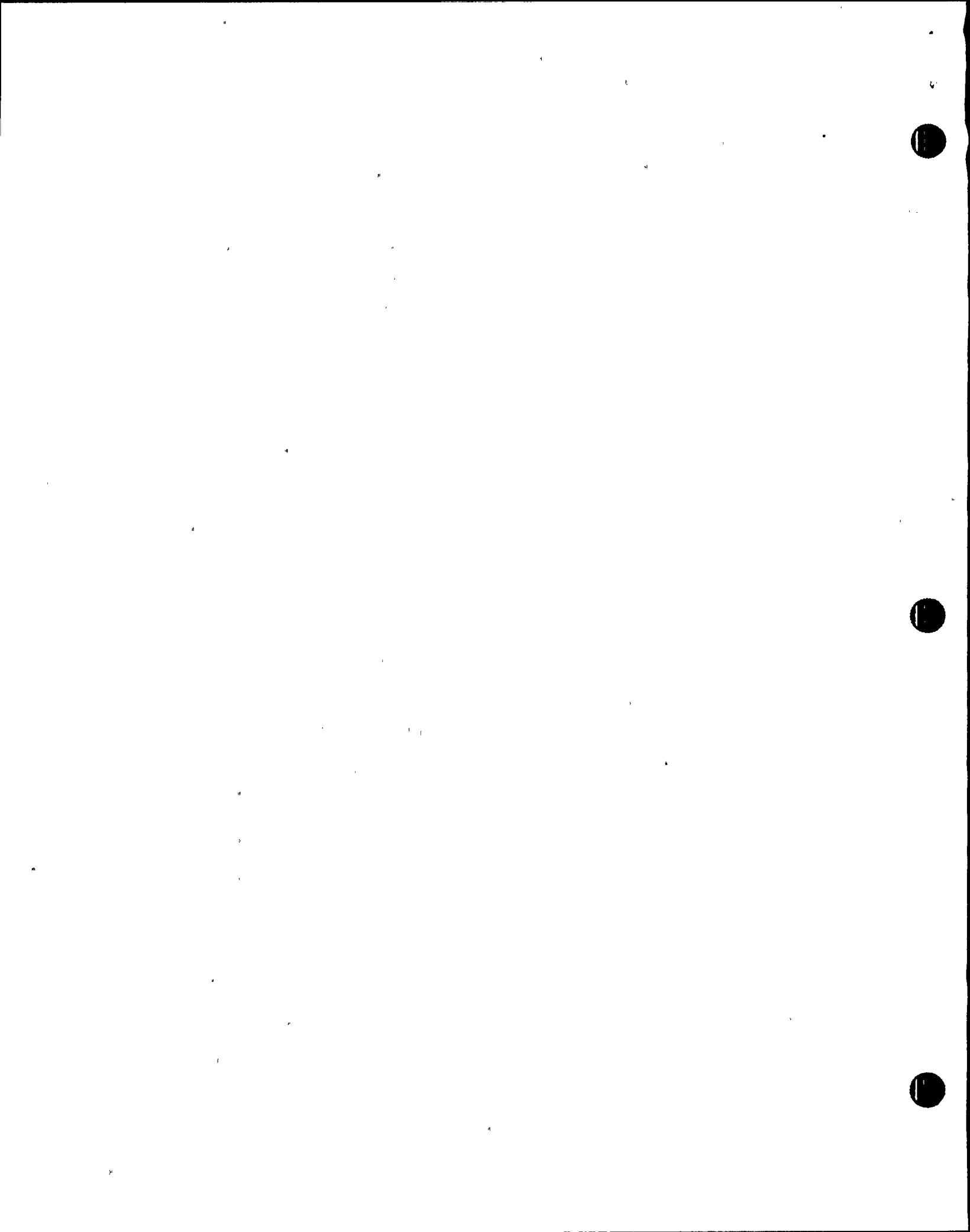
1. High drywell pressure (1.68 psig), level 1 (17.8") and manually.

## B. Automatic initiation the following will occur:

EO-5

1. Div. I diesel generator starts.
2. LPCS pump starts after time delay.

NOTE: 10 secs on normal power, 6 secs when powered from the diesel generator.



3. Test return valve (FV-114) gets a close signal.
4. Injection valve (MOV-104) gets an open signal and will open when D/P across the valve <88 psid.
5. Minimum flow valve (MOV-107) will close when flow exceeds 1200 gpm.

## C. Injection valve, MOV-104

EO-6a

1. Auto opens on system initiation provided the D/P across the valve is less than 88 psid.
2. Valve can be manually closed with an initiation signal present which will be indicated by an amber indicator.

## D. Test return to suppression pool, FV-114

EO-6b

1. Will auto close, if open, upon receipt of an initiation signal.

## E. Minimum flow valve, MOV-107

EO-6c

1. Auto closes when flow > 1200 gpm
2. Auto opens the flow < 1200 gpm

V. RESIDUAL HEAT REMOVAL

Show TP of RHR System for this discussion.

## A. Initiation On

EO-7

1. High drywell pressure (1.68 psig), level 1 (17.8") or manually.

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## B. Automatic initiation the following occurs:

1. Div. I/II diesel generators start.
2. RHR pumps A/B/C auto start following appropriate time delay. NOTE: Normal power A/B 5 secs and C at 10 secs, emergency power A/B 1 second and C at 6 seconds.
3. Heat exchanger bypass valves receive an open signal for 10 minutes.
4. Injection valves, MOV-24A/B/C get an open signal and will open when d/p across the valve is  $\leq$  130 psid.
5. Suppression pool spray mode is automatically secured.
6. Suppression pool cooling mode is automatically secured.
7. Steam condensing mode is automatically secured.

## C. Injection valve, MOV-24A/B/C

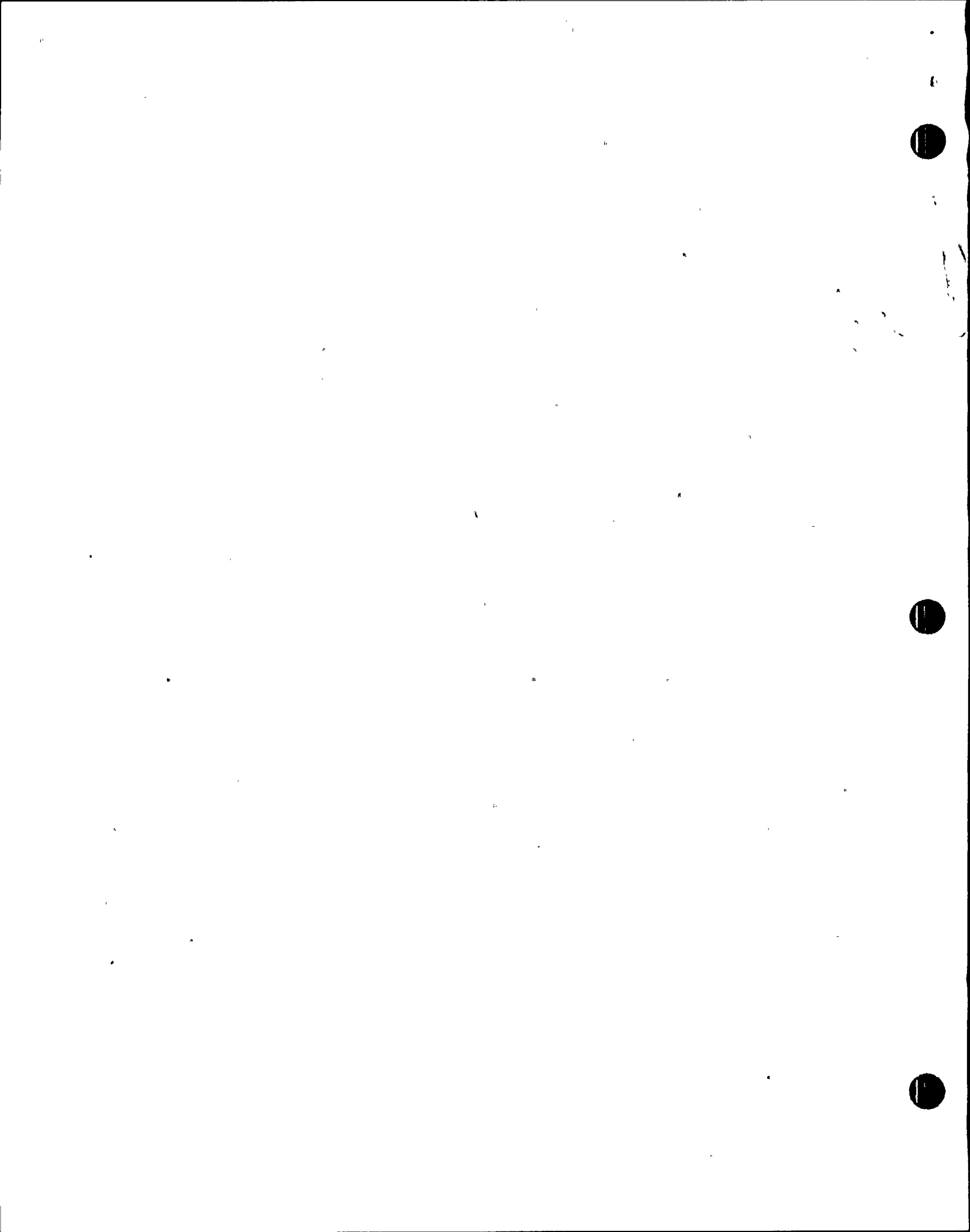
EO-8a

1. Auto opens on system initiation provided the d/p across the valve is  $\leq$  130 psid.
2. Valve can be manually closed with an initiation signal present and will be indicated by an amber valve indicator.

## D. Test return valve, FV-38A/B/C

1. Auto closes on initiation signal.
2. Cannot open with an initiation signal (Amber light) present unless MOV-24A/B/C is shut.
3. Cannot open if MOV-2 is open.

EO-8b





- E. Suppression pool spray valve, MOV-33A/B EO-8c
1. Auto closes on initiation signal.
  2. Can be opened with an initiation signal NOTE: If high drywell pressure clears MOV-33 will close.
    - a. Initiation signal sealed in.
    - b. High drywell pressure exists.
    - c. MOV-24 is shut.
  3. Cannot open if MOV-2 is open.
- F. Drywell spray valves MOV-15A/B and MOV-25A/B EO-8d
1. Interlocked so that only one valve can be opened at a time (Normal Plant Conditions).
  2. Both valves can be opened simultaneously provided the following are met:
    - a. Initiation signal sealed in.
    - b. High drywell pressure exists.
    - c. MOV-24 is shut.
- G. Steam Condensing EO-8e
1. If in steam condensing when an initiation occurs LV-17, MOV-22, MOV-23, PV-21 and MOV-37 will close and they cannot be opened until the initiation signal is reset.
- H. Minimum flow valve MOV-4A/B/C EO-8f
1. Auto closes when flow is  $\geq$  1400 gpm.
  2. Auto opens when flow  $<$  1400 gpm with an 8 second time delay.

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- |   |       |
|---|-------|
| I. Shutdown cooling suction, MOV-2A/B   | EO-8g |
| 1. Cannot be opened unless the following valves are shut:   |       |
| a. MOV-33A/B  |       |
| b. FV-38A/B   |       |
| c. MOV-1A/B   |       |
| J. Suppression pool suction MOV-1A/B  | EO-8h |
| 1. To open MOV-2A/B must be shut.   |       |
| K. RHR pumps P1A/B  | EO-9  |
| 1. Interlocked so that if a suction source is unavailable the pump will trip if running or it will not start. |       |
| 2. The following must be met to satisfy the interlock:  |       |
| a. MOV-1A/B open or   |       |
| b. MOV-112 and MOV-113 and MOV-2 must be open.  |       |

VI. SUMMARY

Review Learning Objectives.

- A. This review of ECCS interlocks was conducted to address an INPO concern during their Fall of 1989 visit.

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