

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION

Ø7-188-91

UNIT II OPERATIONS

OS-STC-001-296-2-00 (Non-Ops)

02-LOT-001-296-2-00 (OPS)

Revision

6

TITLE: REMOTE SHUTDOWN SYSTEM

	<u>SIGNATURE</u>	<u>DATE</u>
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Summary of Pages

(Effective Date: 11-6-90)

Number of Pages: 21

Date

Pages

MASTP
November 1990
THIS LESSON PLAN IS A GENERAL REWRITE

1 - 21

TRAINING DEPARTMENT RECORDS ADMINISTRATION ONLY:

VERIFICATION: _____

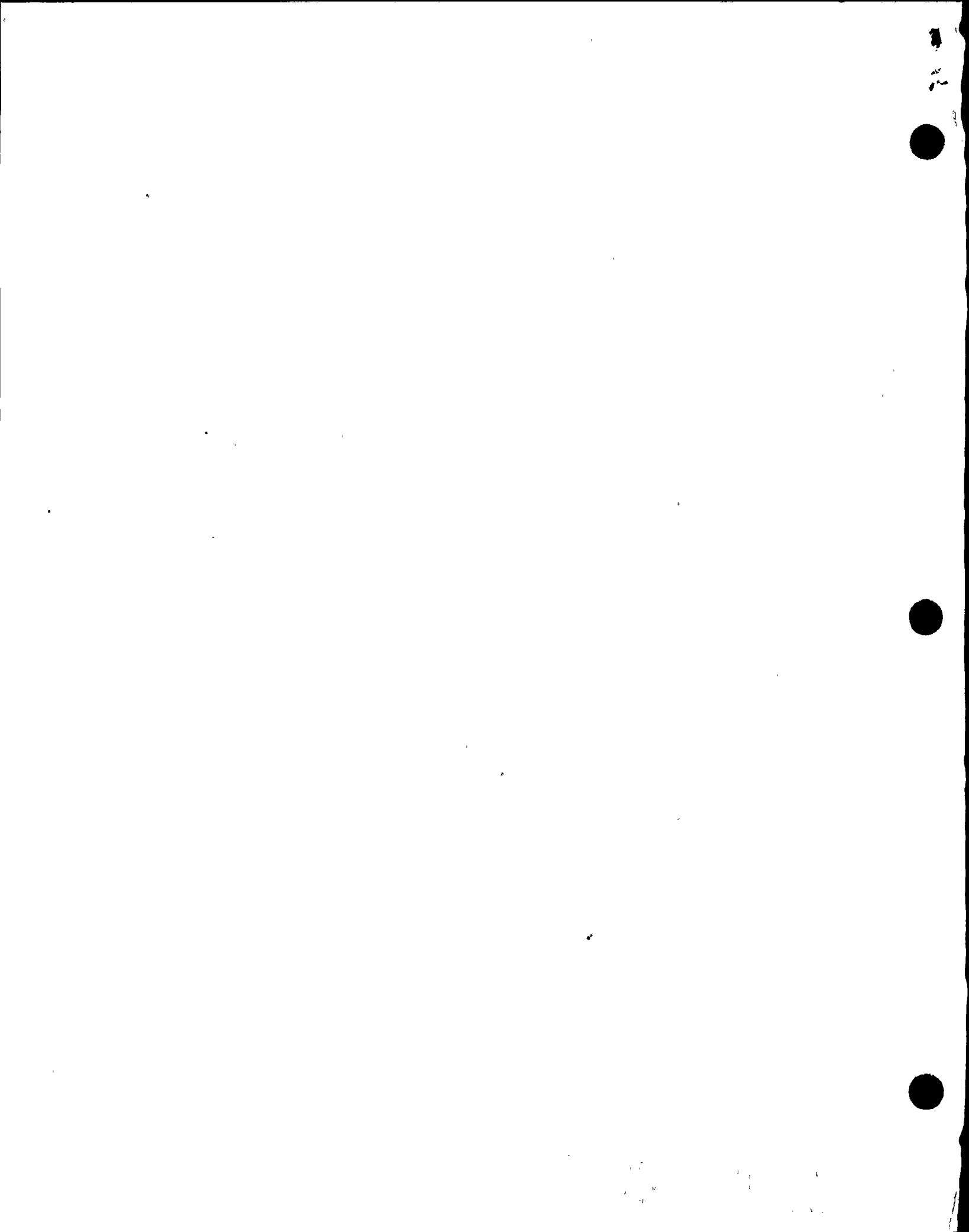
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RECORDS

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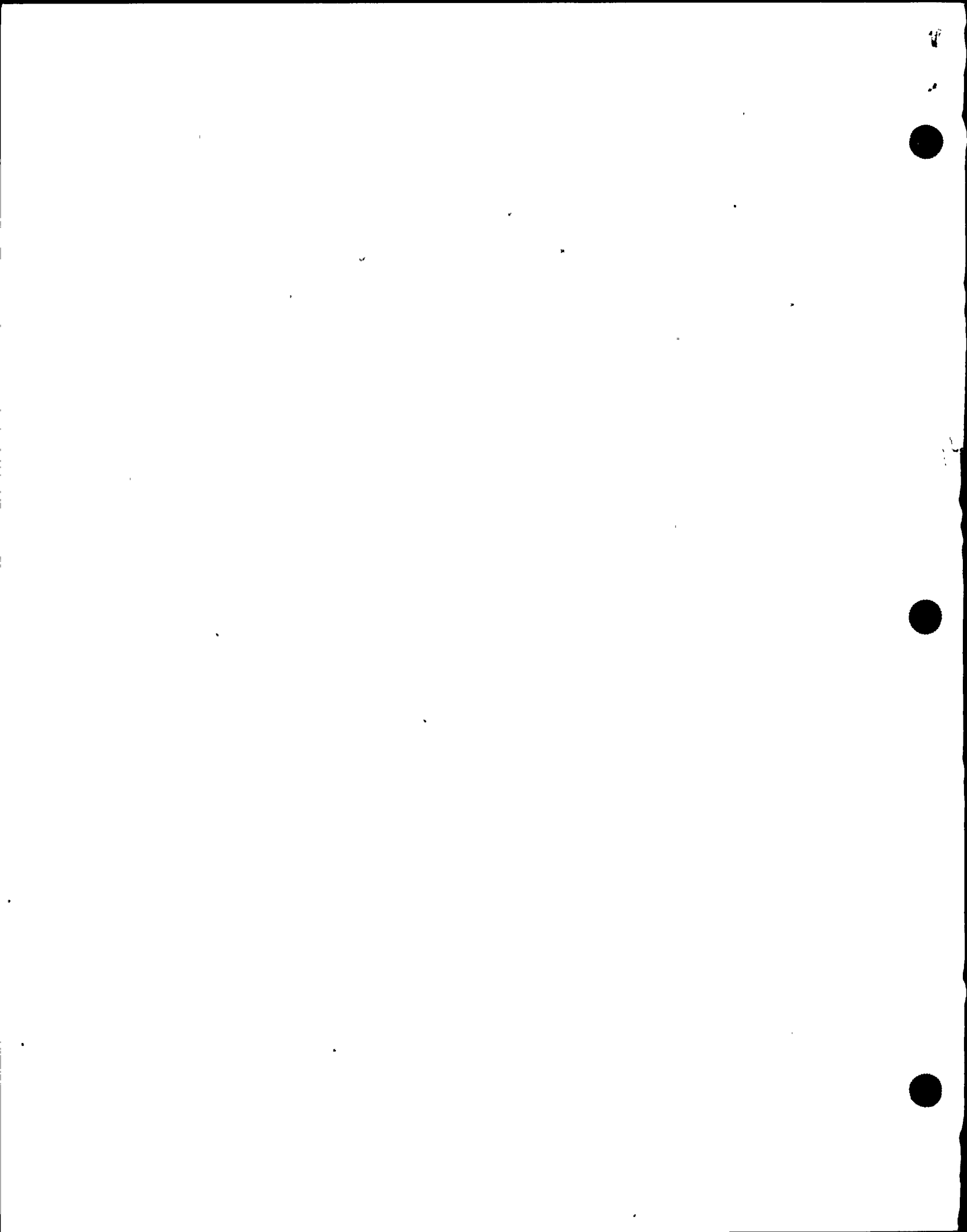
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I. TRAINING DESCRIPTION

- A. Title of Lesson: Remote Shutdown System
- B. Lesson Description: This lesson contains information pertaining to the Remote Shutdown System. The scope of the training is defined by the learning objectives and in general covers the knowledge required of a Licensed Control Room Operator.
- C. Estimate of the Duration of the Lesson: 2 hours
- D. Method of Evaluation, Grade Format and Standard of Evaluation: Written exam passing grade of 80% or greater.
- E. Method and Setting of Instruction: This lecture should be conducted in the classroom.
- F. Prerequisites:
 - 1. Instructor:
 - a. Certified in accordance with NTP-16.
 - 2. Trainee:
 - a. Initial License Candidate - In accordance with the eligibility requirements of NTP-10.
 - b. Licensed Operator Requal - In accordance with the requirements of NTP-11.
- G. References:
 - 1. Technical Specifications
 - a. 3/4.3.7.4 Remote Shutdown System Instrumentation and Controls
 - 2. Procedures
 - a. N2-OP-78 Remote Shutdown System
 - 3. NMP-2 USAR
 - a. Vol. 16, Sect. 7.4
 - 4. 10CFR
 - a. Part 50, Appendix R



II. REQUIREMENTS

- A. AP-9.0, Administration of Training
- B. NTP-10, Training of Licensed Operator Candidates
- C. NTP-11, Licensed Operator Requalification Training
- D. NTP-12, Unlicensed Operator Training

III. TRAINING MATERIALS

A. Instructor Materials:

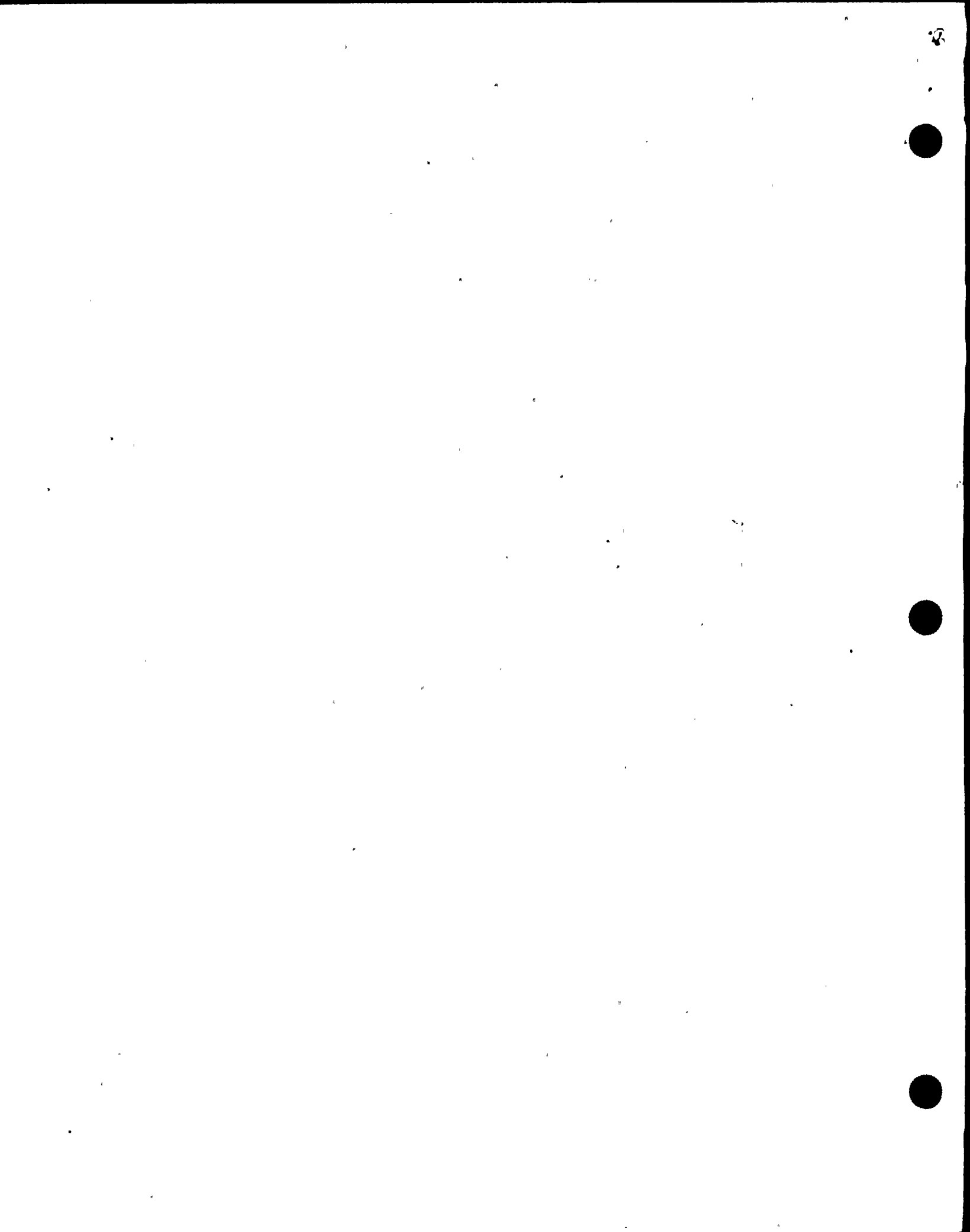
- 1. Transparency package
- 2. Overhead projector
- 3. Whiteboard and felt tip markers
- 4. Classroom
- 5. Lesson Plan, RSS System
- 6. References
- 7. Handouts
- 8. Training Record (TR)

B. Trainee Materials:

- 1. OP Tech Chapter RSS
- 2. Pens, pencils, paper
- 3. Course Evaluation Form

IV. EXAMS AND MASTER ANSWER KEYS

- A. Exams will be generated and administered as necessary.
- B. Exams and Master Answer Keys will be on permanent file.



V. LEARNING OBJECTIVES

A. Terminal Objectives:

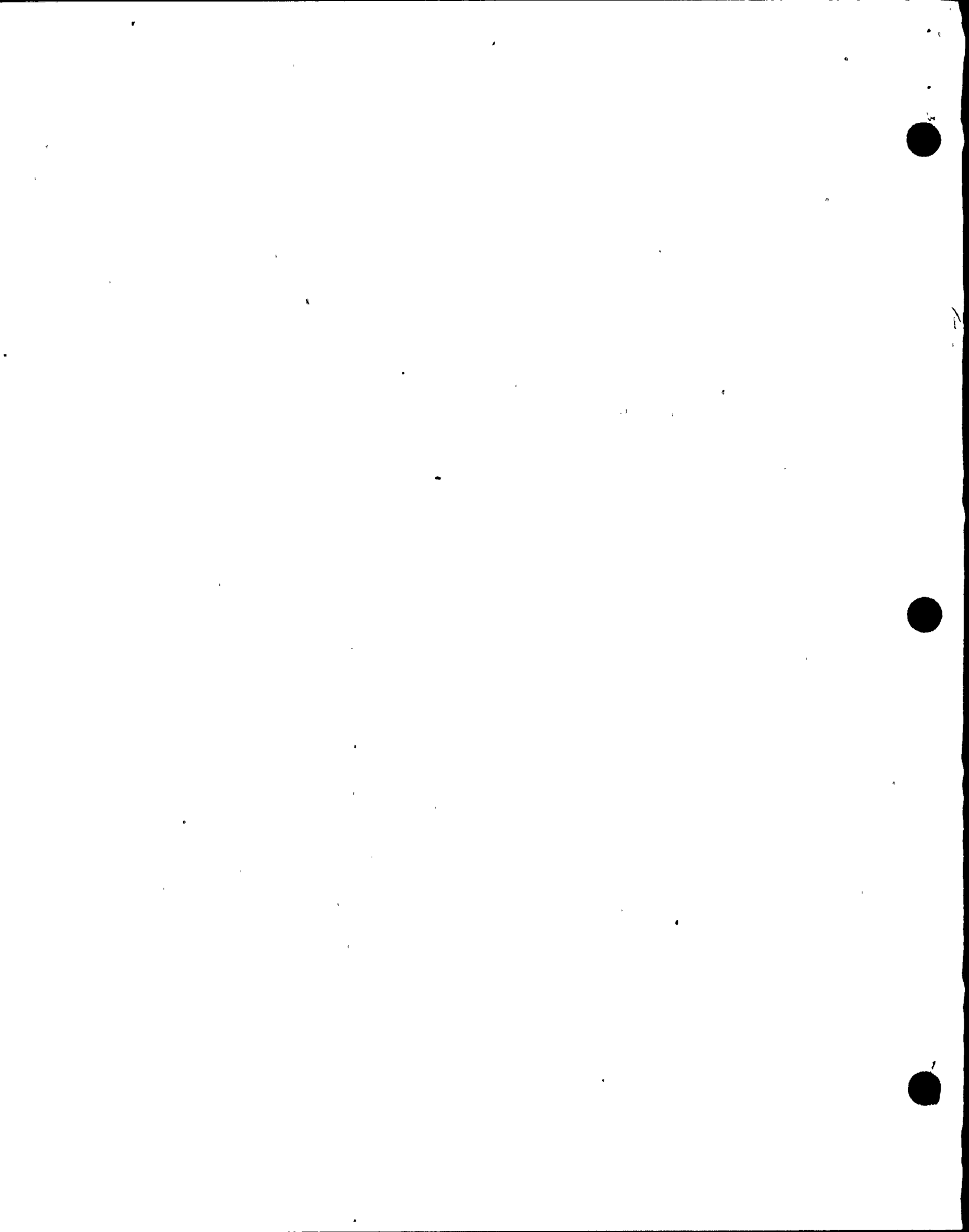
- TO-1.0 To provide the trainee with knowledges of the following that will allow safe and efficient operation of the Remote Shutdown System:
- a. System purpose
 - b. Indications
 - c. Alarms
 - d. Major components
 - e. Normal and abnormal operation
 - f. Operator responsibilities according to procedures
 - g. Technical Specifications
 - h. Normal precautions and limitations
- TO-2.0 To provide the trainee with basic knowledge of the Remote Shutdown System.

Upon completion of training, the trainee will have gained the knowledge to:

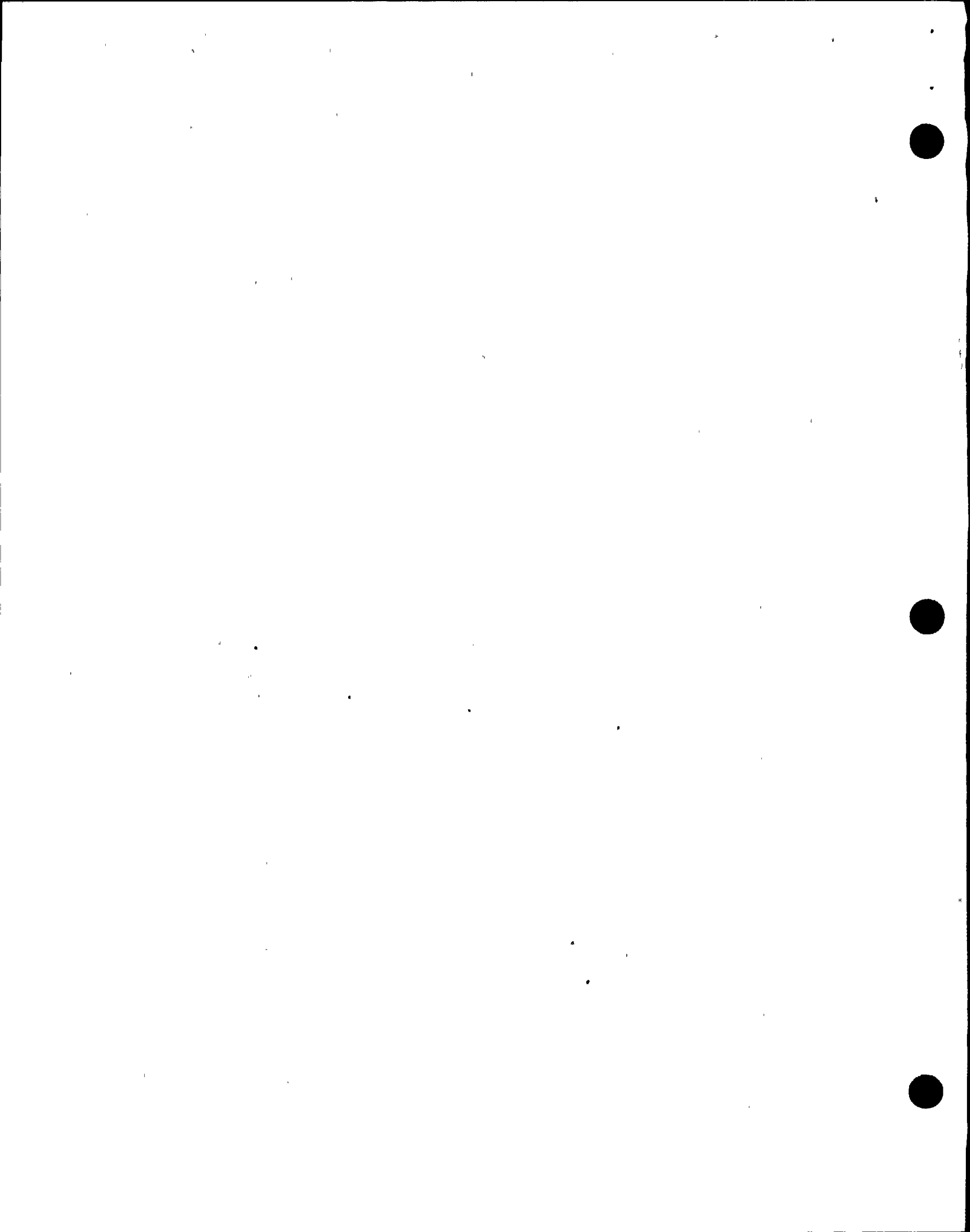
- TO-3.0 Perform the actions required for a Control Room evacuation. (2969010101)
- TO-4.0 Perform the actions required for a Control Room evacuation as the "E" Control Room operator. (2969020101)
- TO-5.0 Perform the actions required for a return to normal operation following a Control Room evacuation. (2969030101)
- TO-6.0 Perform the actions required for a Control Room evacuation as the inplant "E" operator. (2969060101)
- TO-7.0 Perform the actions required for a fire as the in-plant "C" operator. (2969070101)
- TO-8.0 Perform the RCIC Remote Shutdown System test, N2-OSP-RSS-R001. (2969090201)
- TO-9.0 Perform the RHR and Suppression Pool Cooling Systems Remote Shutdown Test, N2-OSP-RSS-R002. (2969100201)
- TO-10.0 Perform the required actions for an "Appendix R" Control SRO ONLY Room evacuation. (2969020493)

B. Enabling Objectives:

- EO-1.0 State the two purposes of the Remote Shutdown System.
- EO-2.0 List two assumptions that are made when it is necessary to evacuate the Control Room and operate in the Remote Shutdown Room.



- EO-3.0 List five systems that can be controlled from the Remote Shutdown Panel.
- EO-4.0 State the number of Safety Relief Valves (SRV's) that can be operated from the Remote Shutdown Panel, and which solenoids are used for operation of the valves.
- EO-5.0 State which modes of the Residual Heat Removal System may be operated from the Remote Shutdown Panel.
- EO-6.0 List three functions that occur when a remote transfer switch is taken to the emergency position.
- EO-7.0 State the three functions of the Appendix "R" disconnect switches.
- EO-8.0 List five automatic safety functions that are bypassed when the Appendix "R" disconnect switches are placed in Actuate.
- EO-9.0 Describe the location of the following:
 - a. Remote Shutdown Panels, 2CES*PNL405 & 406
 - b. Transfer switches
 - c. Appendix "R" disconnect panels, 2CES-PNL415, 416 & 417
 - d. Panels 2VBS*PNLA100 and B100
 - e. Circuit breakers 2RPM*ACB1A, 2A, and 1B, 2B
 - f. Control rod position indication, after MCR evacuation
- EO-10.0 Given N2-OP-78, remote Shutdown System, use the procedure to identify the appropriate actions and/or locate information related :
 - a. Startup
 - b. Normal Operation
 - c. Shutdown
 - d. Off-Normal Operation
 - e. Procedures for correcting alarm conditions
- EO-11.0 (SRO Only) Given Technical Specifications, identify the appropriate actions and/or locate information relating to Limiting Conditions for operation, bases, and surveillance requirements for the Remote Shutdown System.



I. INTRODUCTION

A. Student Learning Objectives

•Show transparency of the objectives. EO-1.0

B. Purpose

- Pass out the TR for initialing.
- Pass out the Evaluation Forms.
- Inform trainees of method of evaluation.

1. Provides the necessary controls and attendant instrumentation to bring the plant to either a hot shutdown or cold shutdown condition when the main control room becomes inaccessible due to fire, toxic gas or heavy smoke conditions.
2. Permits a safe shutdown with the designed appendix "R" fire when used in conjunction with the remote disconnect switches.

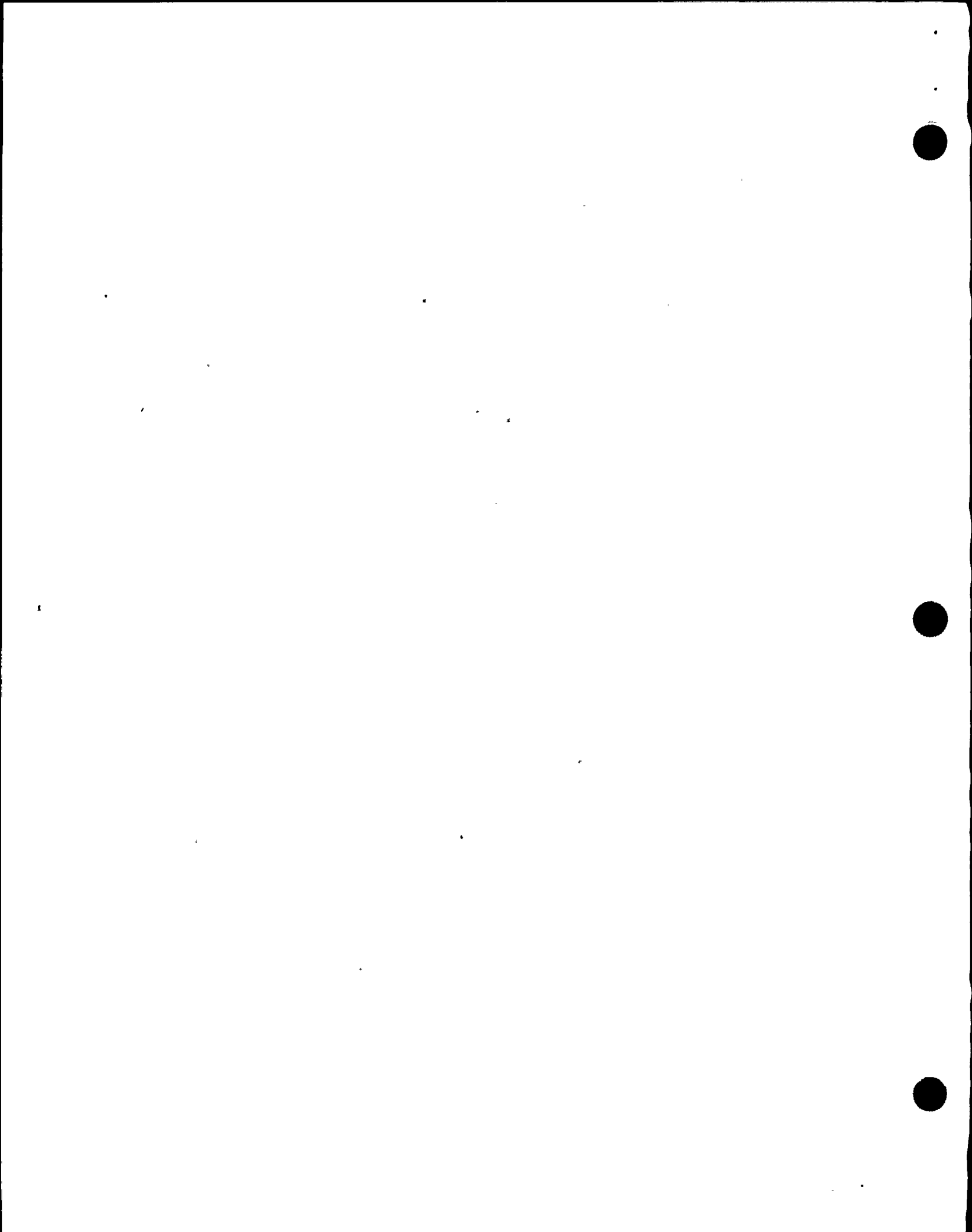
C. Design Bases

1. The RSP is designed to achieve
 - a. Hot shutdown, then
 - b. Cold shutdown from outside the MCR.
2. Postulated Conditions
 - a. The MCR is evacuated and inaccessible.
 - b. The reactor is shutdown (scrammed) prior to the evacuation.
 - c. Rx pressure controlled by the bypass valves or if MSIV's are shut, by the SRV's.
 - d. Rx Feedwater System no longer available.
 - e. Divisional DC power available.
 - f. No Design Basis Accident in progress.

Design criteria from 10CFR50 Appendix A Criterion 19.

EO-2.0

Specifically a LOCA.



D. General Description

1. Provides alternative to normal system controls.

a. Permits shutdown and cooldown from a remote location with:

1. reactor vessel isolated
2. feedwater unavailable
3. normal heat sink lost

2. The Remote Shutdown Panel is the major component of the RSS System.

2CES*PNL405 & 406

405 is the Div. I side

406 is the Div. II side

a. Provides controls for systems necessary to achieve the Hot S/D to Cold S/D conditions.

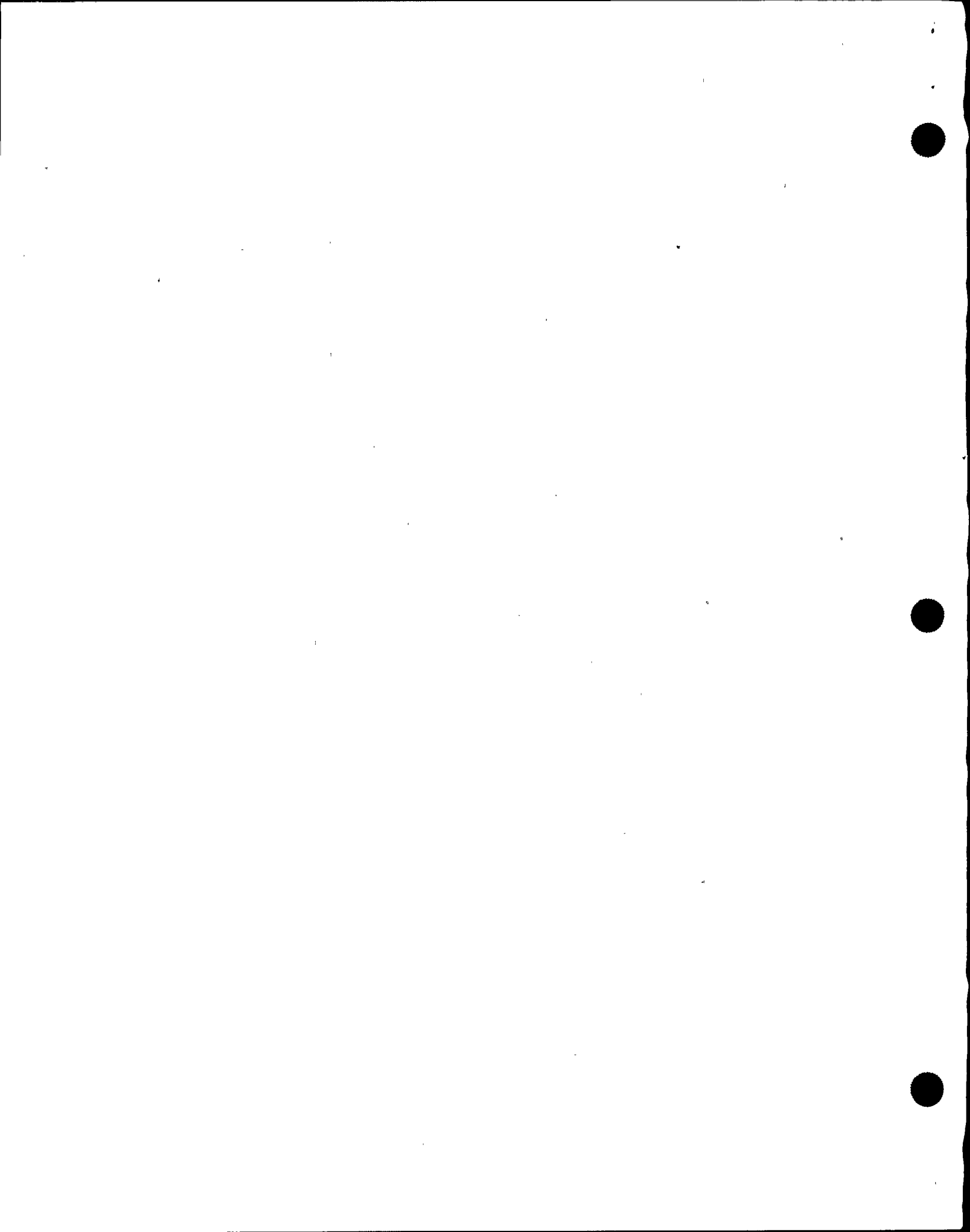
b. Provides instrumentation necessary to achieve the Hot S/D to Cold S/D condition.

3. Allows operation of the following systems.

- a. RHS
- b. RCIC
- c. ADS SRV's
- d. Service water
- e. RSS room ventilation

The modes of operation of the RHS System will be discussed later in this presentation.

EO-3.0



4. Appendix 'R' disconnect switches.
 - a. 39 switches located on panels
 1. 2CES*PNL415, 416 & 417
 - b. Further isolates the MCR controls.

II. DETAILED DESCRIPTION

A. Remote Shutdown System - General

1. The Panel is divided into Division I and Division II sections. The divisional sections are separated by a 3 hr. fire wall. Located on elevation 261' of the Control Building.
2. The panels contain the following:
 - a. Control switches - selected safe shutdown components have control switches on the RSP's to facilitate system operations.
 - b. Instrumentation - selected parameters are displayed for monitoring system operation.
 - c. Keylock Transfer Switches - Transfer control of selected components from the control panels to the RSP's.

2CES*PNL405/406

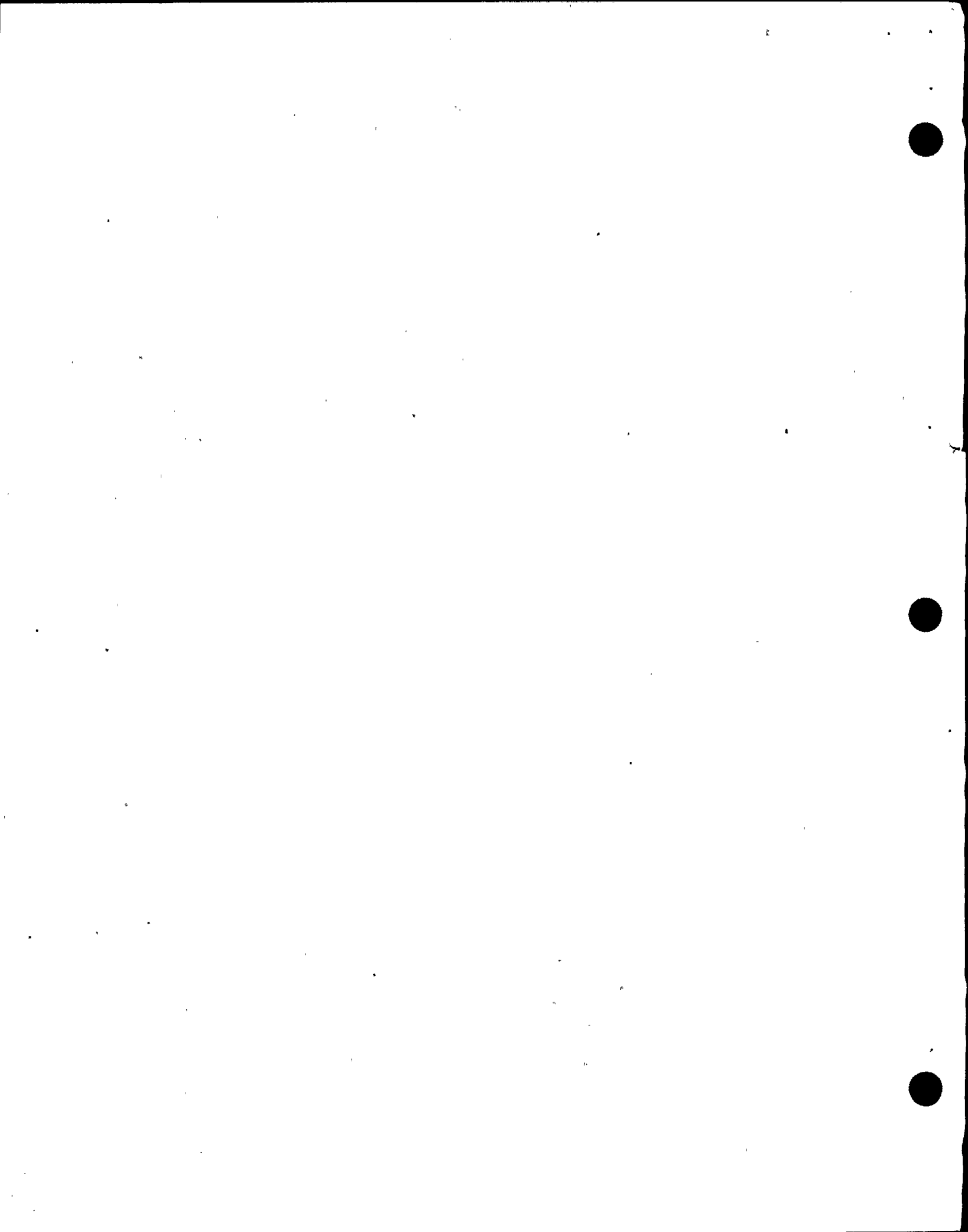
EO-9.0a

Define: Safe Shutdown System - A system as selected by the USAR necessary to S/D and maintain in a safe shutdown condition the Primary System.

Positions of the transfer switches 'Normal' and 'Emergency'.

EO-9.0b

Keys for the transfer switches kept in the RSP Room.



B. Remote Shutdown Panel

1. RCIC System (ICS)

a. Division I RSP

1) Rector Core Isolation Cooling (CS) ICS System maintains adequate water inventory to reactor vessel when normal feed is isolated. The ICS components necessary for ICS operation can be operated from the panel including:

- a) ICS turbine
- b) All valves required for operation.

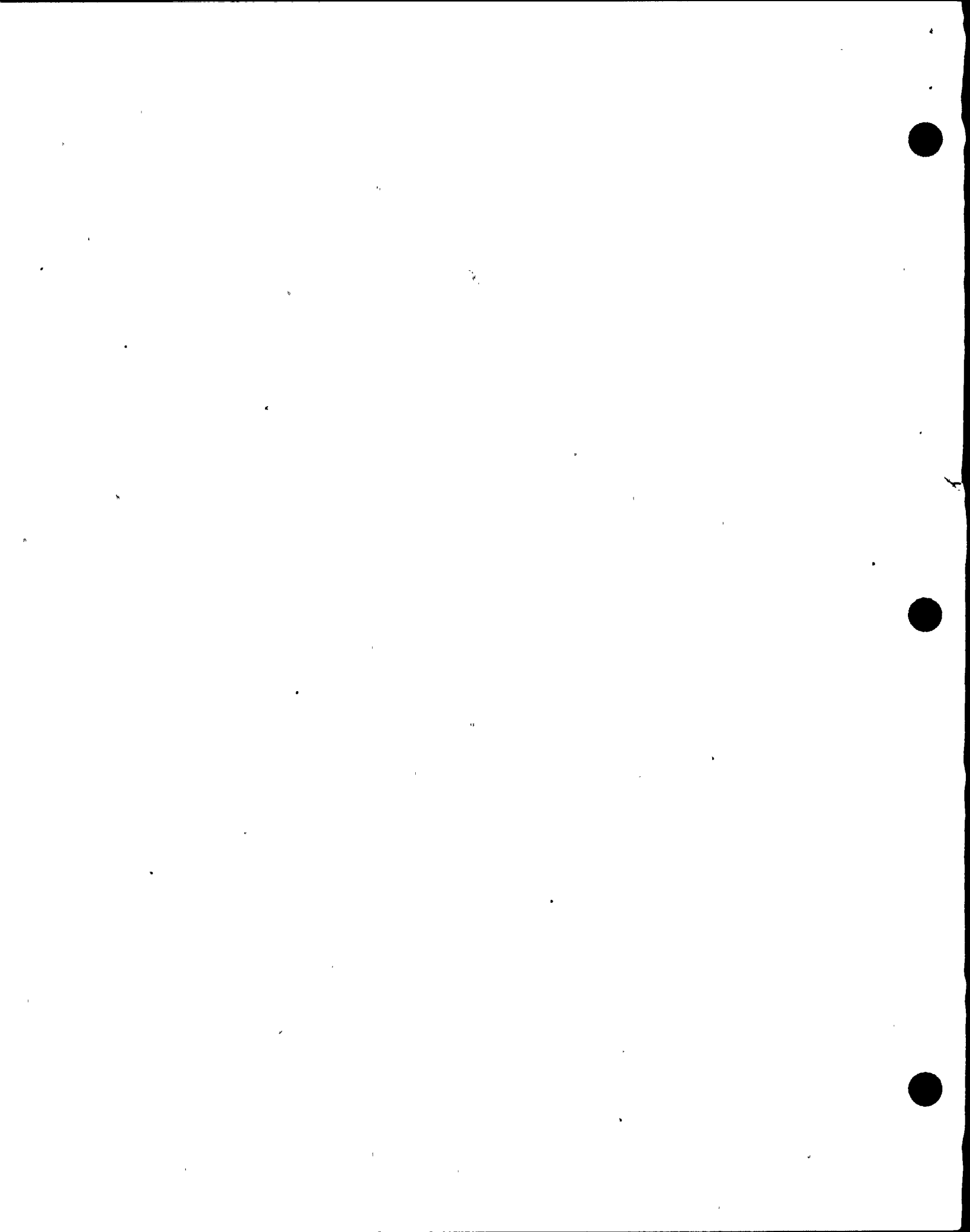
b. The Division-II RSP

1) The ICS System controls on the division II panel consist only of a transfer switch.

- a) Transfer control of the Division II ICS components.

When App. 'R' activated all the RCIC turb., trips and auto functions except overspeed are bypassed. Increased operator awareness is required to compensate.

The only controls or switches associated with RCIC on the Div. II panel is this single switch, #2.



2. Automatic Depressurization (ADS)

a. Division I

- 1) Four ADS function SRV's (PSV121, PSV127, PSV129, PSV137) utilizing the A solenoids.
- 2) Also available are the IAS containment isolation valves and high flow SOVX 181/186 valves for N² Makeup to ADS accumulators.

4 SRV's, one from each main steam line (MSL) to equalize stresses on MSL's during SRV operation and SRV's selected on basis of location of discharge to Supp. Pool to allow for more even heating of the Supp. Pool.

EO-4.0

b. Division II

- 1) Four ADS function SRV's (PSV 121, 127, 129, 137) utilizing the "B" solenoids.

3. RHS System

a. Division I

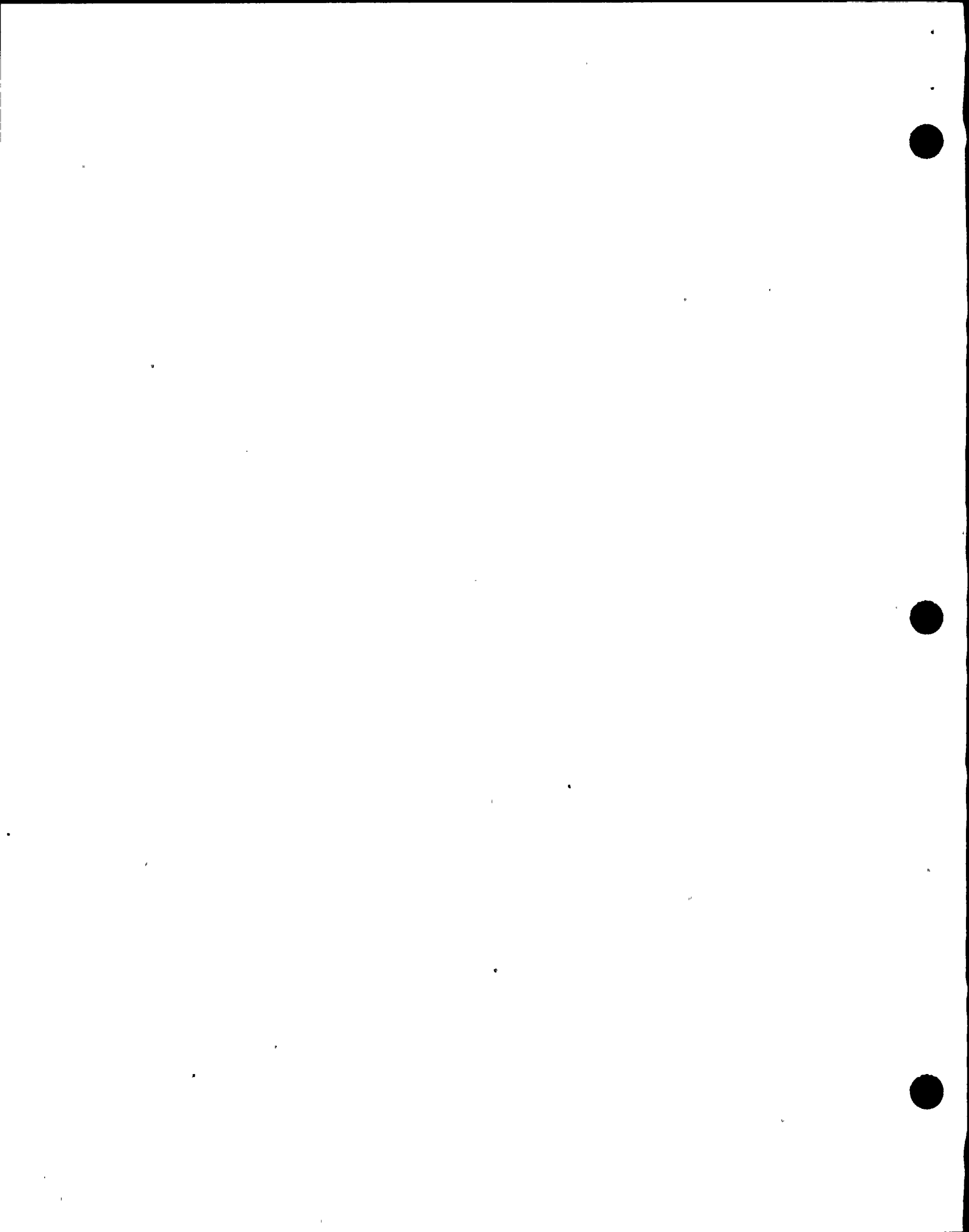
- 1) RHS Loop 'A'
 - a) Pump controls, vlv controls sufficient to operate the loop in the following modes:
 - Suppression Pool Cooling
 - Shutdown Cooling
 - 'pseudo' LPC1 injection

The RHS System is affected by activation of the Appen. 'R' switches as follows

EO-5.0

- 1) LPC1 auto initiation is bypassed (all loops)
- 2) Cnmt isolation of groups 4 & 5 (RHS sampling & S/D cooling) as bypassed - implies increased operator attention required to cnmt parameters, & vessel level.

Pseudo LPC1 - is injection into the vessel through the MOV40A(B) valve outside the core shroud vice inside the shroud as in normal LPC1 injection.



b. Division II

1) RHS Loop 'B'

- a) Pump controls, vlv controls sufficient to operate the loop in the following modes:
- Suppression Pool Cooling
 - Shutdown Cooling
 - 'pseudo' LPCI injection

MOV 112 & 113 S/D cooling suction valves are located on the Div. II panel.

4. Service Water (SWP)

a. Division I

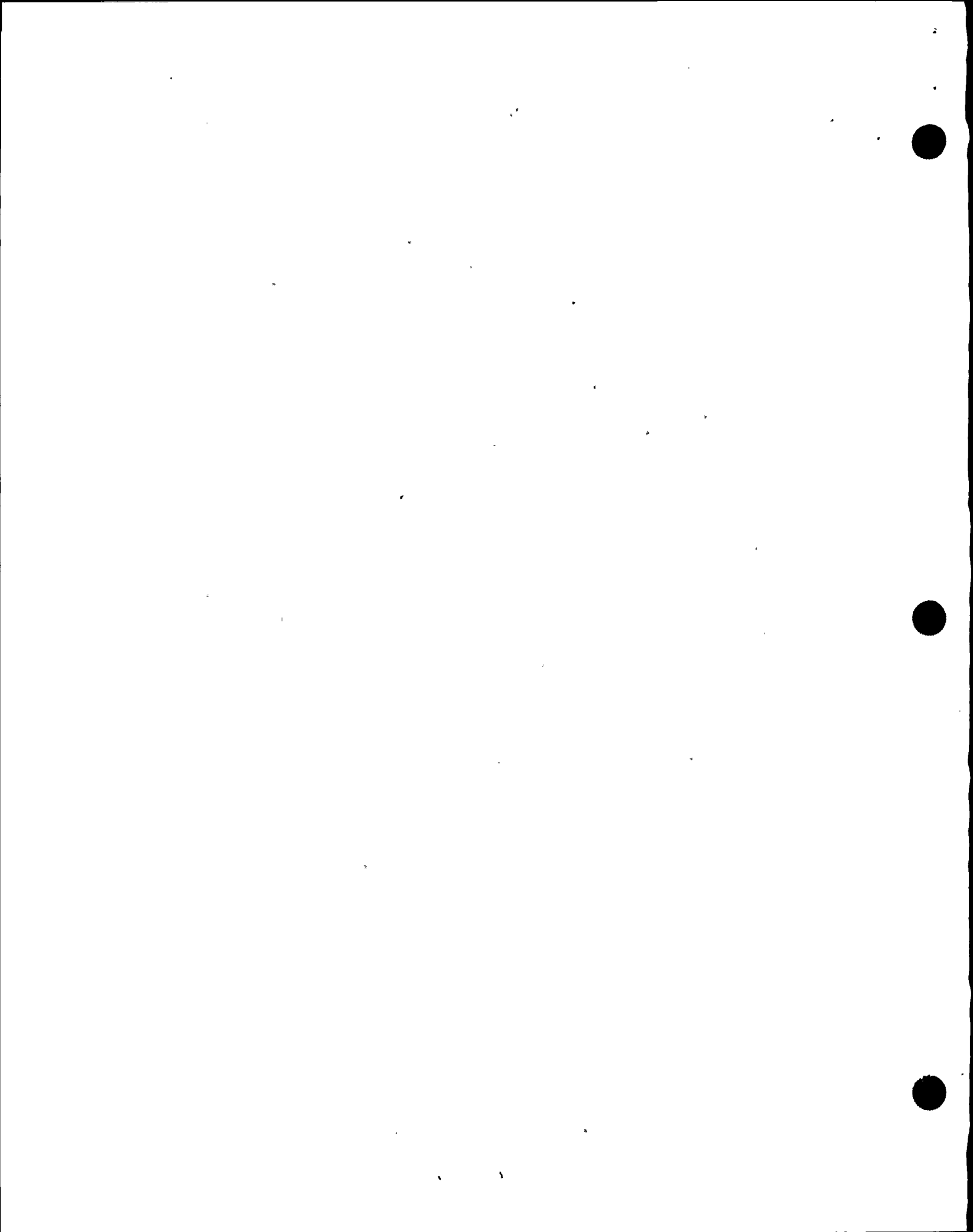
- 1) SW to RHS "A" heat exchanger
- 2) SW to Emergency Diesel Generator EG1 (Div I DG)
- 3) SW pumps 1A, 1C, & 1E

With the Appen. 'R' disconn's activated the low flow trip (<1000 gpm for 10 sec.) is bypassed for all SWP pumps.

If a Div. I or II DG starts while the RSP is activated operator actions is required to L/U cooling water (SWP) to the DG from the RSP.

b. Division II

- 1) SW to RHS "B" heat exchanger
- 2) SW to emergency diesel generator EG-3 (Div. II DG)
- 3) SW pumps 1B, 1D and 1F



5. Remote Shutdown Room HVAC

- a. Division I
 - 1) Control for the air handling unit in the Div. I side of the room.
- b. Division II
 - 1) Control for the air handling unit in the Div. II side of the room.

6. Additional Equipment

- a. Division I
 - 1) Process computer terminal w/screen.
 - 2) Printer driven by process computer.
 - 3) Gaitronics console.

The process computer is used to obtain control rod position indication after the MCR is evacuated.

EO-9.0f

All others process computer functions are also available from this terminal.

C. Power Supplies

- 1. The RSP is supplied by divisional AC and DC supplies.
- 2. Fused at the RSP.

III. INSTRUMENTATION, CONTROL AND INTERLOCKS

A. Instrumentation

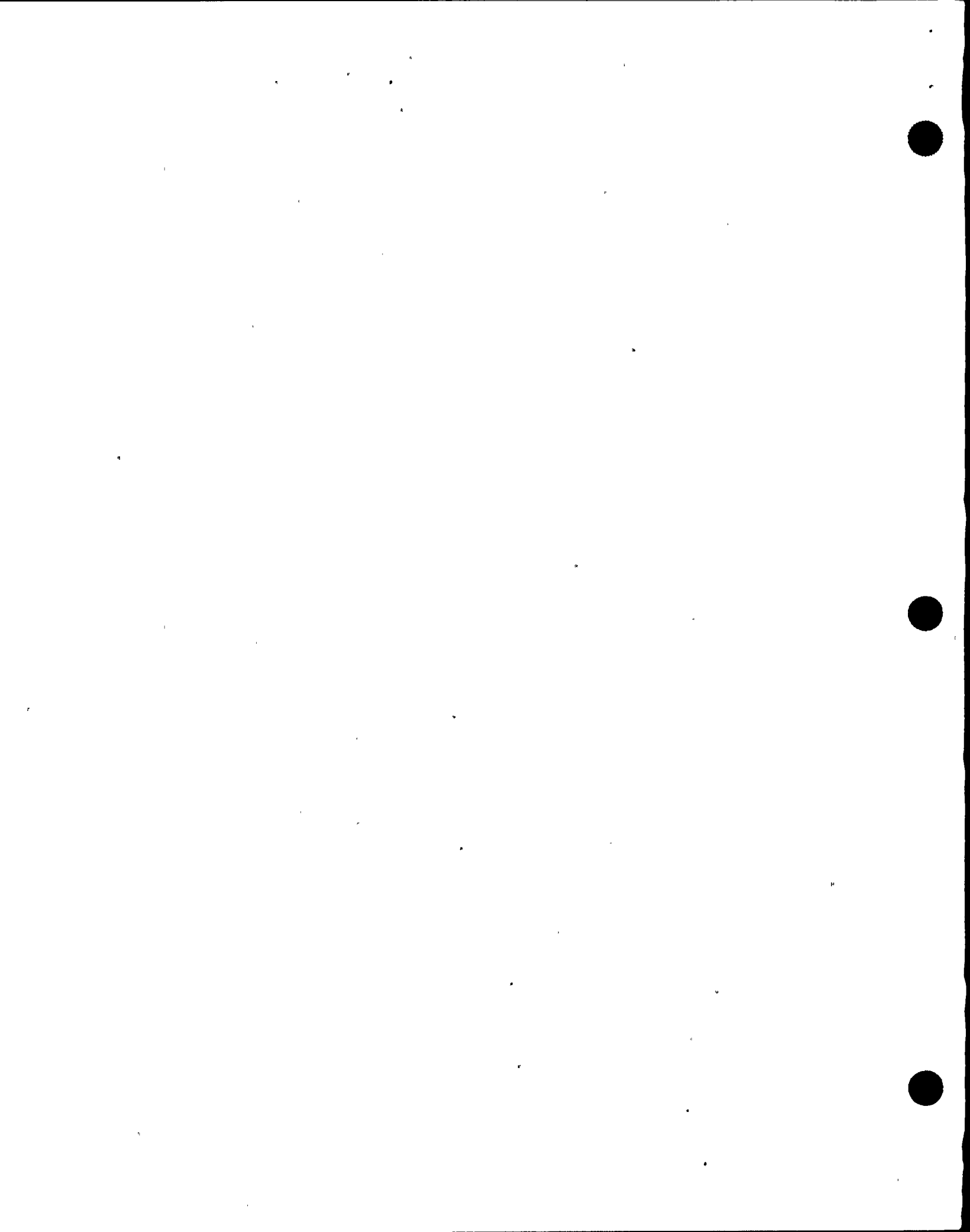
- 1. Div. I and Div. II Panels
 - a. Reactor Pressure
 - b. Rx Level-Narrow Range
 - c. Rx Level-Wide Range

Show transparency of table 6.

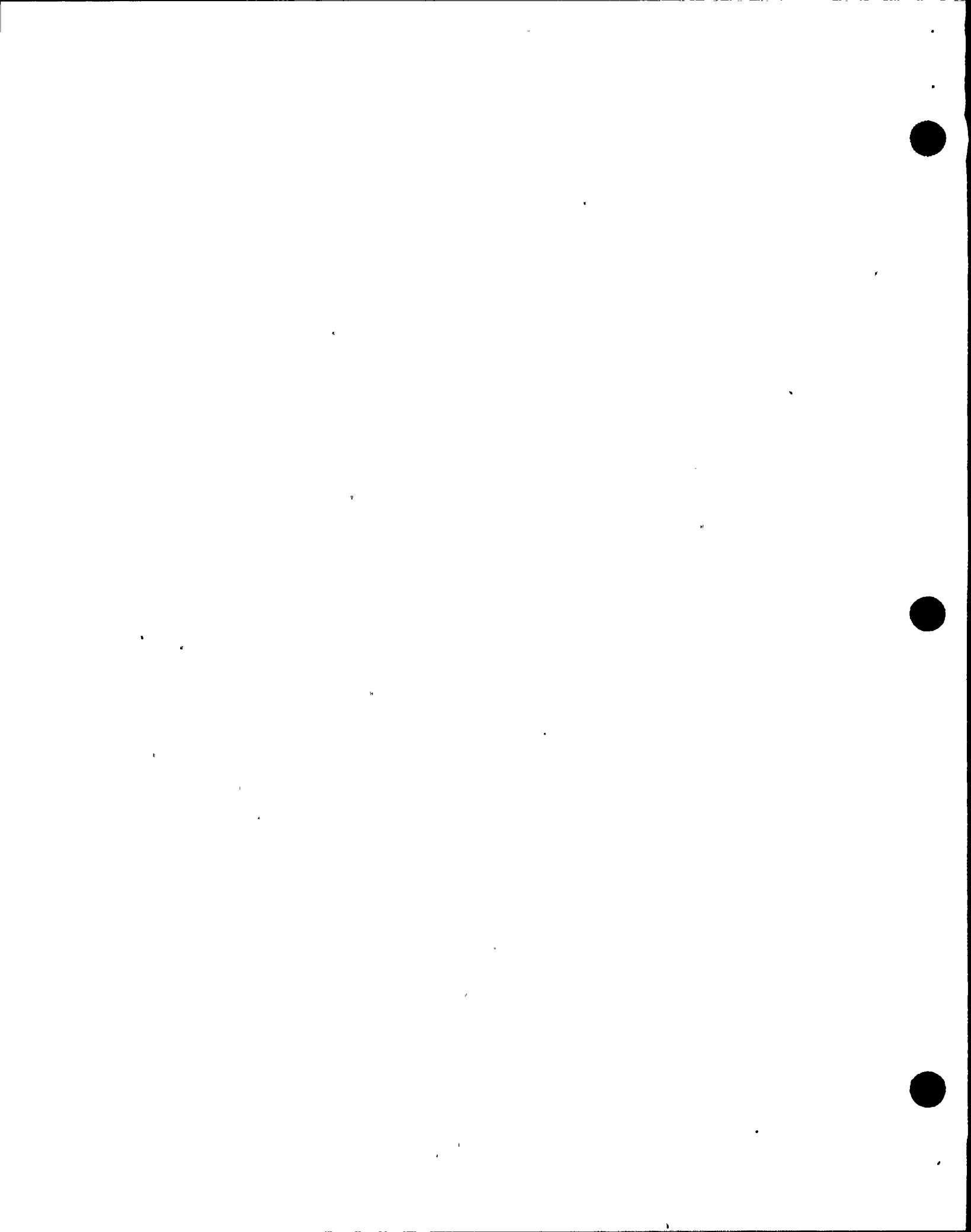
The pressure meter markings also have the corresponding saturation temperatures marked on the meter face.



- d. Service Water Pump Flows
 - e. Suppression Pool Water Level
 - f. Suppression Pool Water Temperature
 - g. CST Level (A & B)
 - h. RHR Loop Flows
 - i. RHR HX SW Flow
 - j. RHR HX SW Outlet Temperature
 - k. RHR HX Inlet and Outlet Temperature
(Recorder)
 - l. ADS Accumulator Tank Pressures
 2. Div. I Only
 - a. RCIC Turbine Speed
 - b. RCIC Pump Flow
 - c. Rx Vessel Bottom Drain and Shell
Temperature. (Recorder)
- B. Controls
1. Remote Shutdown Transfer Switches
 - a. 19 two position (NORMAL/EMERGENCY)
switches on the RSP are used to for
transfer control of the components from
the RSP.
 - 1) In the NORMAL position the
components are controlled from the
control room.



- 2) In the EMERGENCY position the components are controlled at the RSP.
- b. When switches are operated (repositioned) to the Emergency position these things (functions) occur.
- 1) The MCR switches are disabled.
 - 2) The RSP switches are enabled.
 - 3) Annunciators on P-601 come in.
2. Appendix 'R' Disconnects
- a. The term Appendix "R" comes from the Code of Federal Regulations Title 10, part 50, Appendix "R" dealing with the Fire Protection Program for Nuclear Power Facilities operating prior to January 1, 1979.
 - b. The scenario for an Appendix "R" fire is a fire in which the Control Room must be evacuated and has the potential to disable systems required for safe shutdown (either hot or cold), by preventing operation or causing misoperation due to Hot Shorts, Open circuits, or Shorts to ground.
- ANN 601420 Division I Remote SHTDN XFER Switch Emer. Position EO-6.0
- ANN 601510 Division II Remote SHTDN XFER Switch in Emer. POSN.



c. Appendix "R" Disconnect Switches

Located in locked cabinets mounted on either side of the Control Room in the Cable runs. (PNLS-2CES*PNL-415, 416 & 417)

When activated:

- 1) Isolates circuits from the Control Room.
- 2) Transfers selected component control to the RSP.
- 3) Automatically operates selected components to place systems in reliable lineups.

Pnls 415 & 417 are located in the west cable chase.

Pnls 416 is located in the each cable chase.

39 switches total.

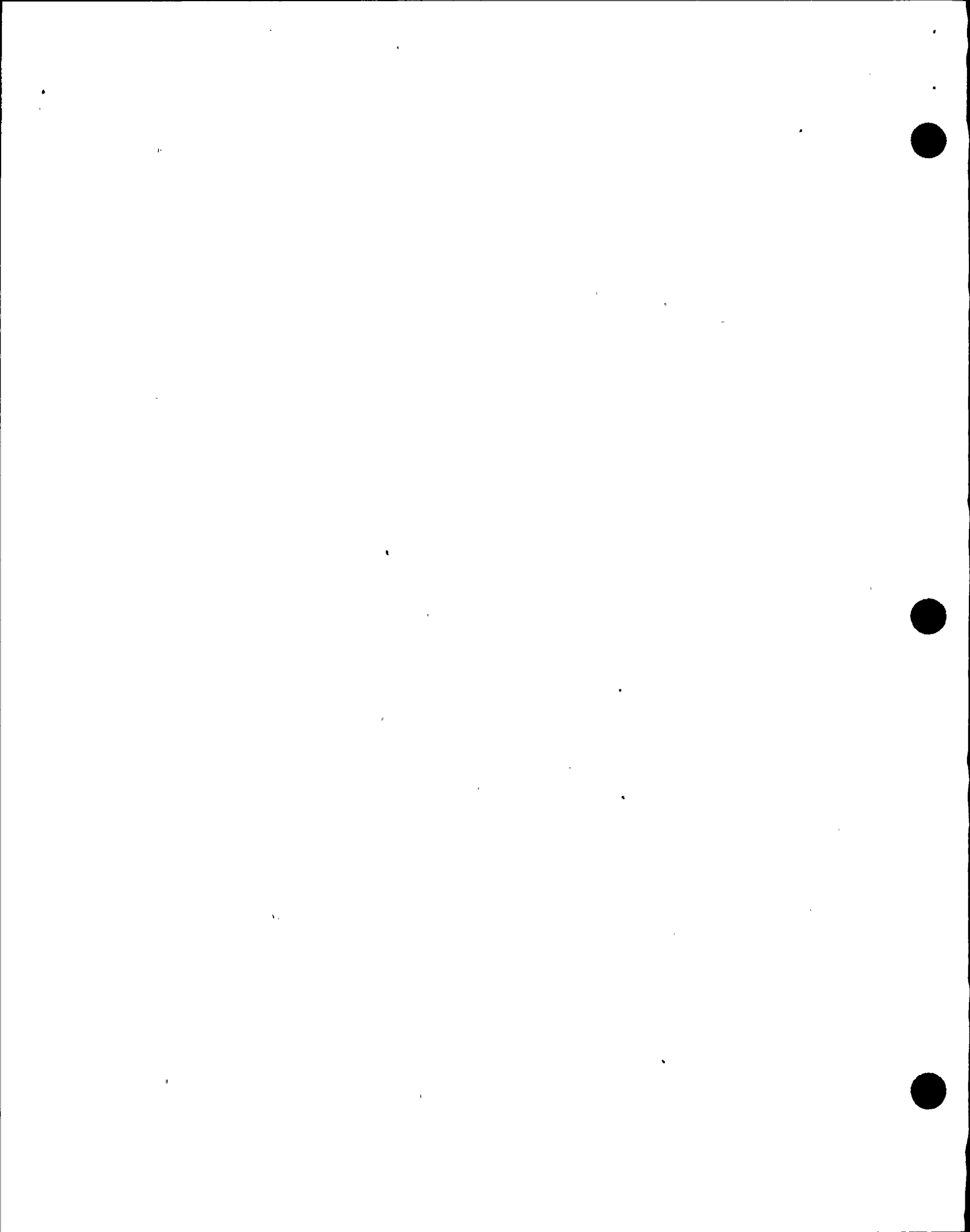
Refer table 3 for each switches function.

EO-9.0c

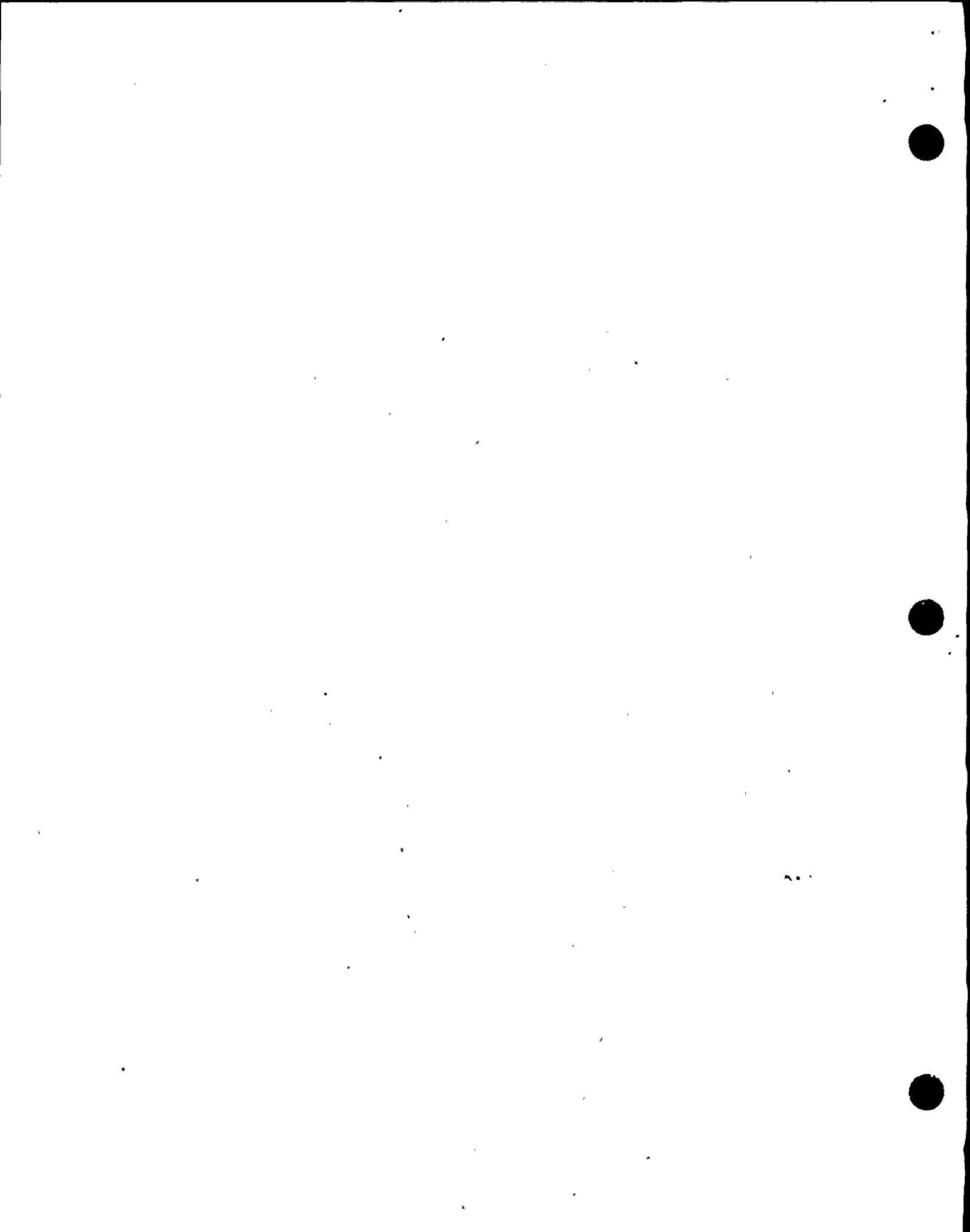
EO-7.0

C. Interlocks

1. With ADS initiation signals present, transfer to RSP will not prevent automatic initiation.
2. When a remote transfer switch is taken to the emergency position:
 - a. Associated Control Room controls are disabled.
 - b. Control Room annunciators alarm for Div I and/or Div II switches
 - c. Associated remote shutdown switches are enabled.



3. Reactor Core Isolation Cooling System
 - a. When operating the RCIC System from the RSS panel in the Appendix "R" mode (disconnect switches in the activated position), all RCIC steam supply isolations and all RCIC turbine trips are negated with the exception of mechanical overspeed and manual trip from the RSS panel. In addition, the auto closure of the steam inlet valve (MOV-120) has been removed, therefore on high level this must be manually accomplished.
4. Residual Heat Removal
 - a. When operating the RHS System from RSS panel in the Appendix R mode (disconnect switches in the activated position), all primary containment isolation signals are deactivated for all components located on the RSS panel, and LPCI initiation is disabled.



5. Service Water

- a. If the diesels should start after service water system control has been transferred to the Remote Shutdown Panel, the service water inlet cooling valves to Div. I and Div. II must be manually opened from the RSS panel to provide cooling to the diesels.
- b. Prior to transferring the service water pumps to the RSS panel place the control switches for the pumps which are running to the AUTO AFTER START position.

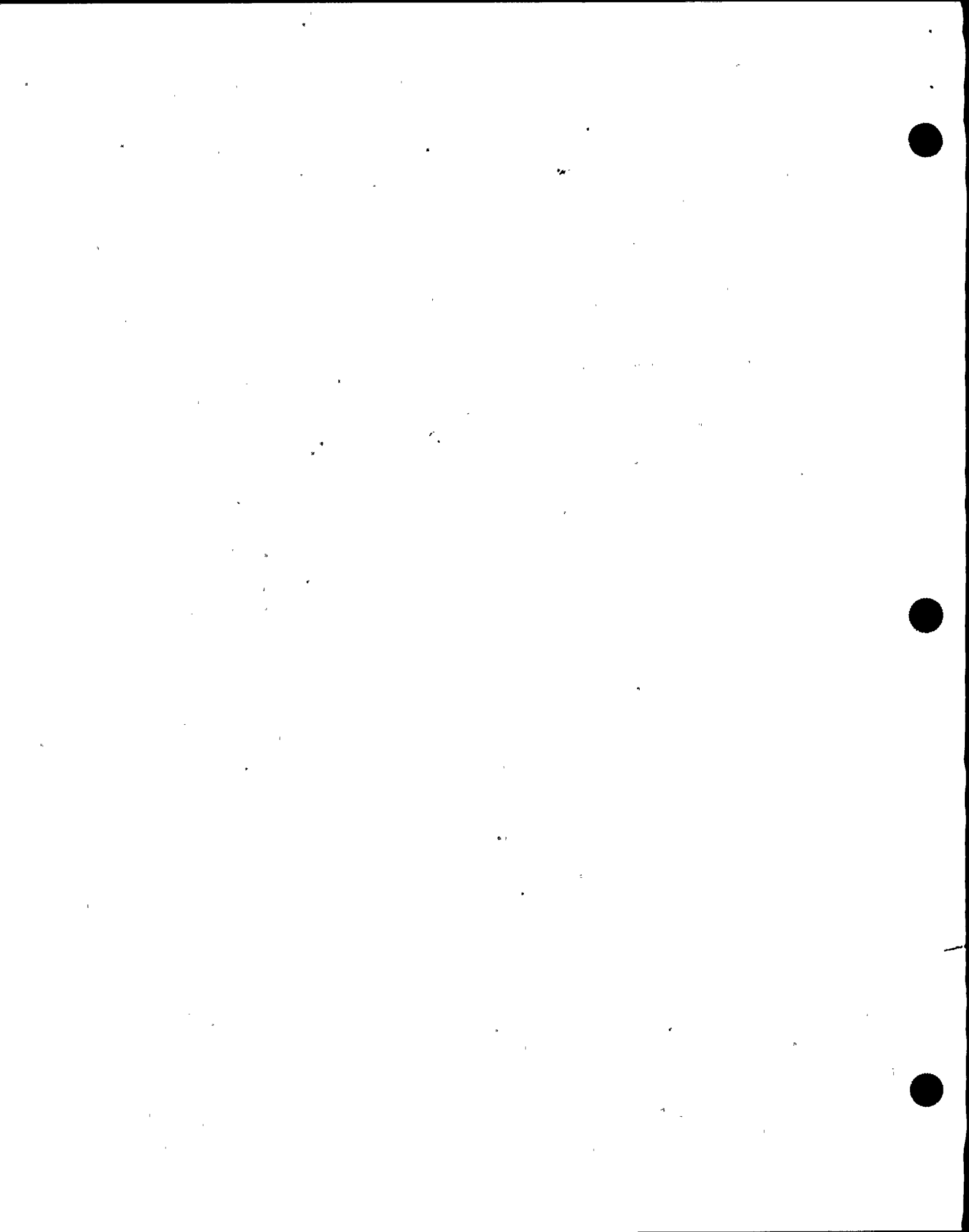
A loss of SWP flow will occur if this isn't done.

6. Automatic Depressurization System

- a. When operating in the Appendix R mode (disconnect switches in the activated position), the relief mode and the ADS mode of the pressure relief valves is negated; automatic operation of the pressure relief valves is only in the safety mode. Manual operation of the ADS valves (2MSS*PSV 121, 127, 129 and 137) is available via the ADS solenoids from the Remote Shutdown Panel.

Ask candidates if they remember the set pts for the SRV's in the relief and safety modes.

	<u>Relief</u>	<u>Safety</u>
	2 vlvs 1076 psig	1148 psig
	4 vlvs 1086	1175
	4 vlvs 1096	1185
	4 vlvs 1106	1195
	4 vlvs 1116	1205



- b. In addition, the nitrogen high load pressure control valves (2IAS*SOVX-181/186) and containment isolation valves (2IAS*SOV 164 and 165) control is transferred to the RSS panel via the disconnect switches.
7. When a remote shutdown transfer switch is returned to normal, control of the affected component is returned to the main control room. Therefore, the control switches in the control room must be in the desired position prior to returning the transfer switch to normal.
8. With the Appendix 'R' disconnect switches the following automatic functions are bypassed:
 - a. Initiation of LPCI (all loops)
 - b. Initiation of LPCS
 - c. Initiation of ADS
 - d. Initiation of RCIC
 - e. Containment isolation groups
 - 1) Group 4 RHS sample valves.
 - 2) Group 5 RHS shutdown cooling.

A loss of SWP flow will occur if this isn't done.

EO-8.0

Automatic initiation (L2 and D.W. press.)



VI. DETAILED SYSTEM REFERENCE REVIEW

Review each of the following reference documents with the class:

A. Technical Specifications

EO-11.0

1. 3.3.7.4 Remote Shutdown Instrumentation and Controls.
2. Technical Specifications Interpretation
#25 Operability of Nine Mile Point Unit 2 unit coolers.
#49 Rev. 1 Remote shutdown instrumentation.

B. PROCEDURES

EO-9.0A-

1. N2-OP-78, Remote Shutdown System

F, 10

VII. RELATED PLANT EVENTS

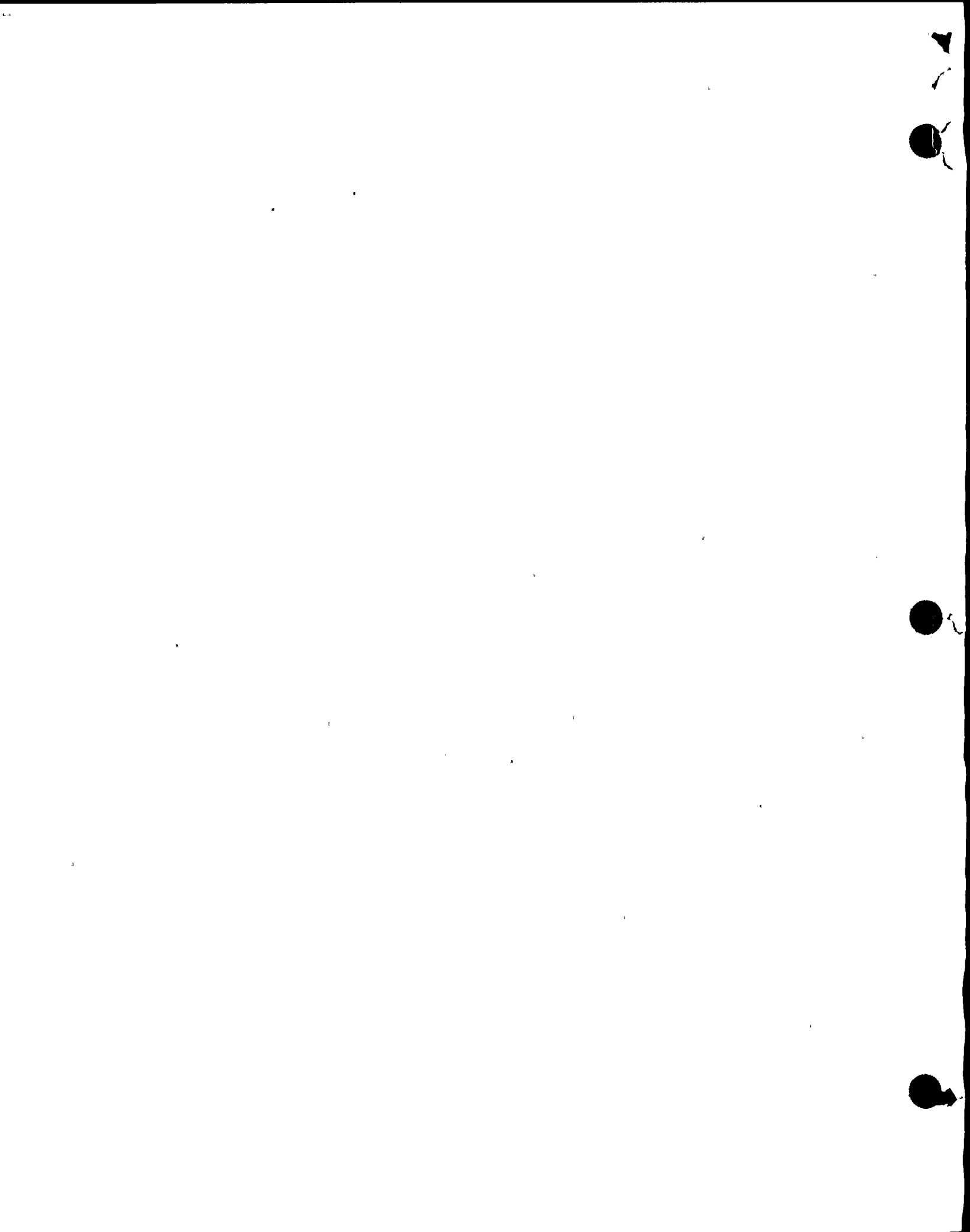
- A. Refer to addendum "A" and review related events with the class (if applicable).

VIII. SYSTEM HISTORY

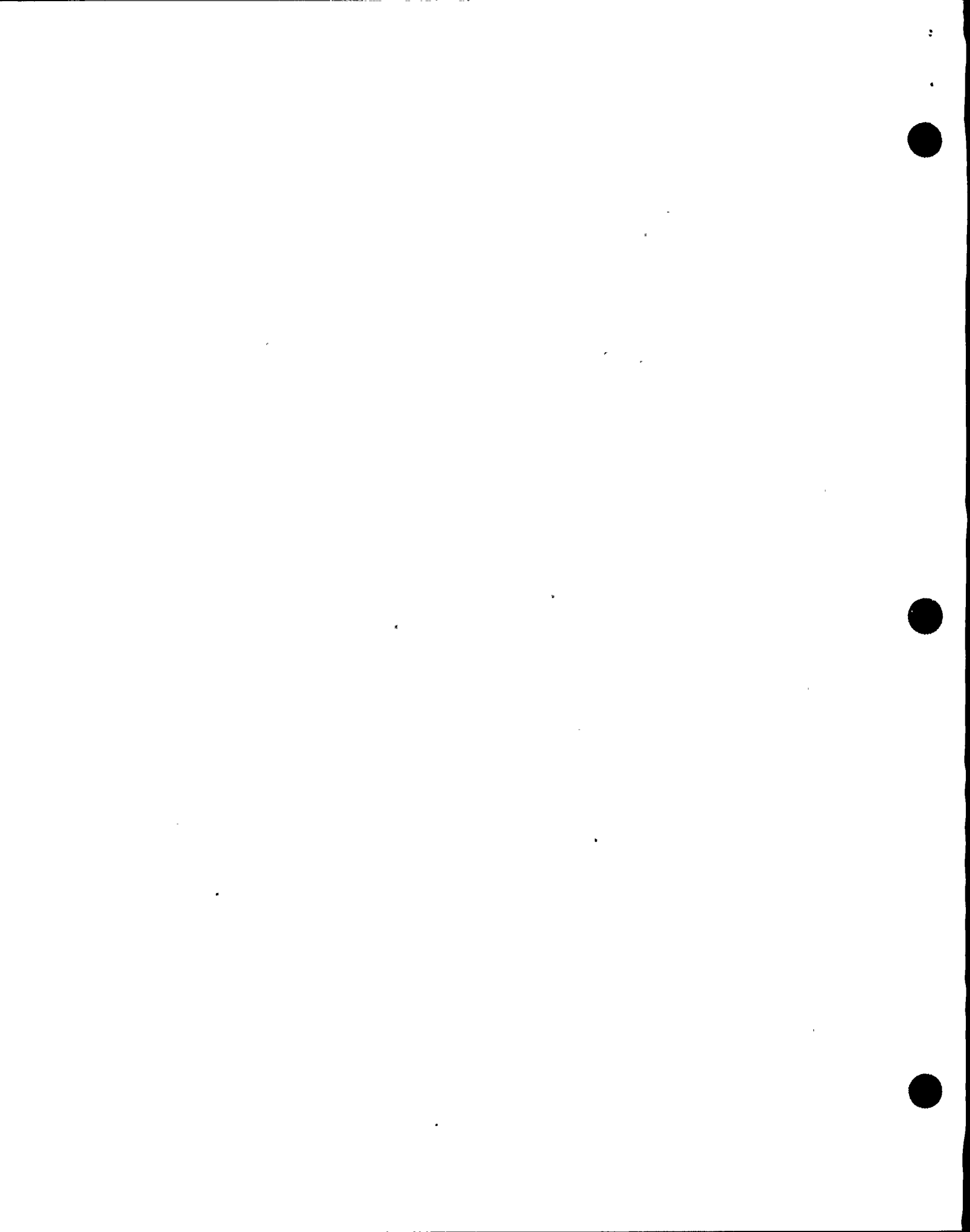
Refer to addendum "B" and review related modifications with the class (if applicable).

IX. WRAP-UP

- A. Review the student learning objectives.



- B. Reactor Core Isolation Cooling System (ICS)
The ICS System can be used to inject water into the reactor vessel from the remote shutdown panel.
- C. Containment Monitoring System (CMS)
The CMS System provides suppression pool temperature and level measurements to the remote shutdown panel.
- D. Service Water System (SWP)
The SWP System can be operated to cool the RHS heat exchangers and the emergency diesel generators from the remote shutdown panel.
- E. Main Steam System (MSS)
4 ADS safety relief valves can be operated from the remote shutdown panel (2MSS*SOV 121A/B, 127A/B, 129A/B, & 137A/B).
- F. Reactor Vessel Instrumentation (RVI)
The RVI System provides reactor vessel pressure, level and temperature indication to the remote shutdown panel.
- G. Automatic Depressurization System (ADS)
The ADS provides indications of ADS accumulator pressure to the remote shutdown panel.
- H. Condenser Transfer and Storage System (CNS)
The CNS System provides condensate storage tank level to the remote shutdown panel.

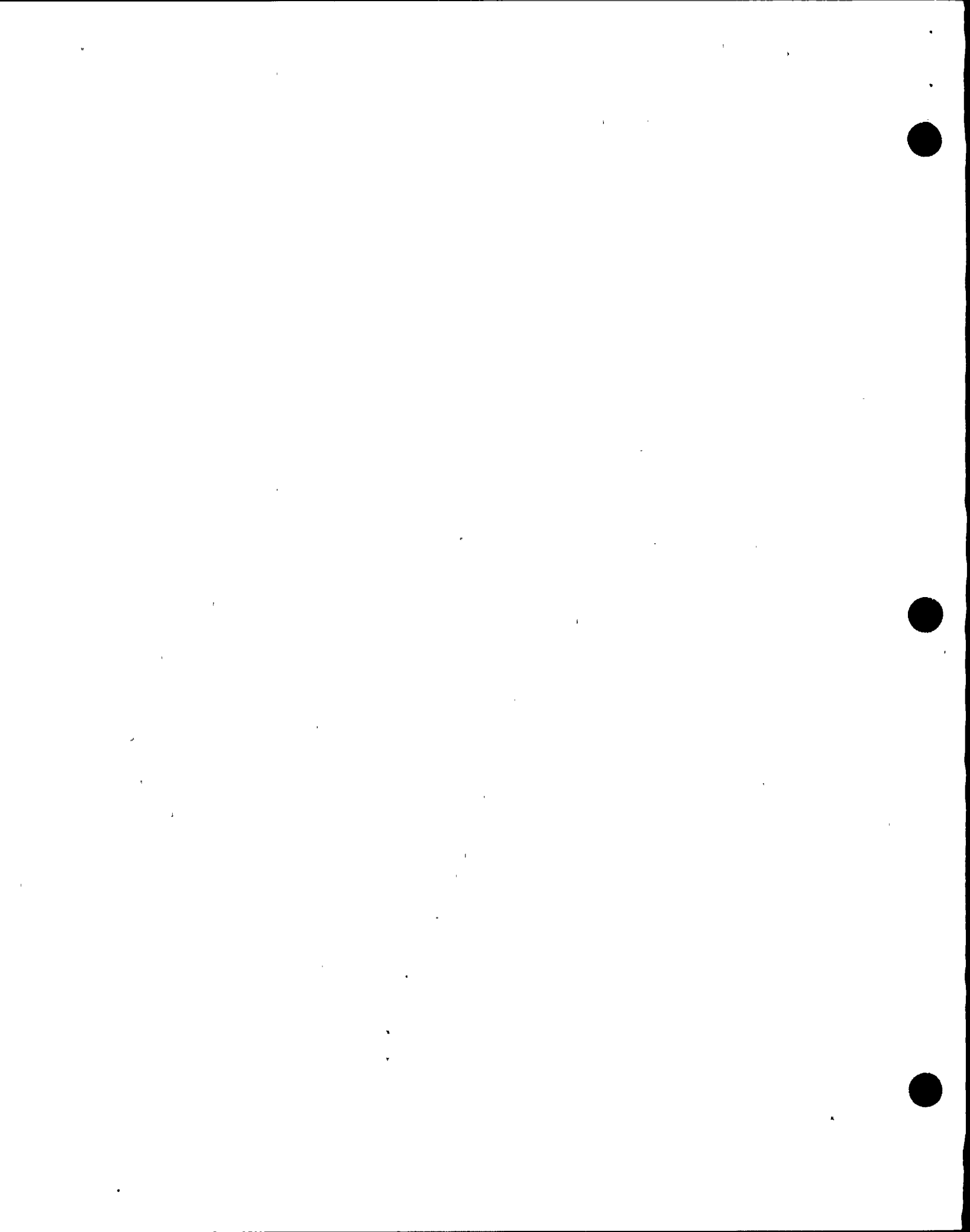


2. The transfer switches are used to allow system operation from the panel.
3. The Appendix "R" disconnect switches are operated disconnecting selected equipment using the disconnect switches to allow proper operation and or prevent misoperation.
4. The operator opens the SRV's to depressurize and cooldown the Rx.
 - a. ICS is used to supply makeup water to the Rx.
 - b. RHS is operated to cool the suppression pool.
5. When the reactor pressure and temperature are low enough, the RHS system is shifted to the Shutdown Cooling mode and used to continue the cooldown of the reactor.

V. SYSTEM INTERRELATIONS

A. Residual Heat Removal System (RHS)

The RHS System can be operated in the suppression pool cooling, shutdown cooling, and alternate shutdown cooling (pseudo-LPCI) modes from the remote shutdown panel.



- 3) Group 10 RCIC System
- 4) ADS nitrogen supply valves
(partial group 8)
- f. Service water pump low flow trip (all).
- g. Pressure relief mode of the SRV's (all).

IV. SYSTEM OPERATION

A. Normal Operation

Remote Shutdown Panel is in standby ready for use in the event the main Control Room is uninhabitable. The remote shutdown transfer switches are in normal.

B. Off Normal

The term "Off-Normal Procedures" for the remote shutdown system is defined as any condition which requires the evacuation of the main Control Room and use of the remote shutdown panel to maintain the Reactor in a hot shutdown condition or to bring the Reactor to a cold shutdown condition.

C. Control Room Evacuation

1. When the control room has to be evacuated, the assumptions are made that the Rx is scrammed and no LOCA has occurred, the operator will use the remote shutdown panel to bring the reactor to a cold shutdown condition.

