

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT NUCLEAR STATION
UNIT II OPERATIONS

07-192-91

02-NLO-001-296-2-01 Revision 0

TITLE: REMOTE SHUTDOWN SYSTEM

	<u>SIGNATURE</u>	<u>DATE</u>
PREPARER	<u>N/A</u>	<u>N/A</u>
TRAINING SUPPORT SUPERVISOR	<u>Nancy B. Holden for P. ReClair</u>	<u>11/9/90</u>
TRAINING AREA SUPERVISOR	<u>Office Copy for P. Slade</u>	<u>11-9-90</u>
PLANT SUPERVISOR/ USER GROUP SUPERVISOR	<u>W. H. ... FOR CTS ...</u>	<u>11/9/90</u>

Summary of Pages

(Effective Date: 11/9/90)

Number of Pages: 20

<u>Date</u>	<u>Pages</u>
November 1990	1 - 20

TRAINING DEPARTMENT RECORDS ADMINISTRATION ONLY:

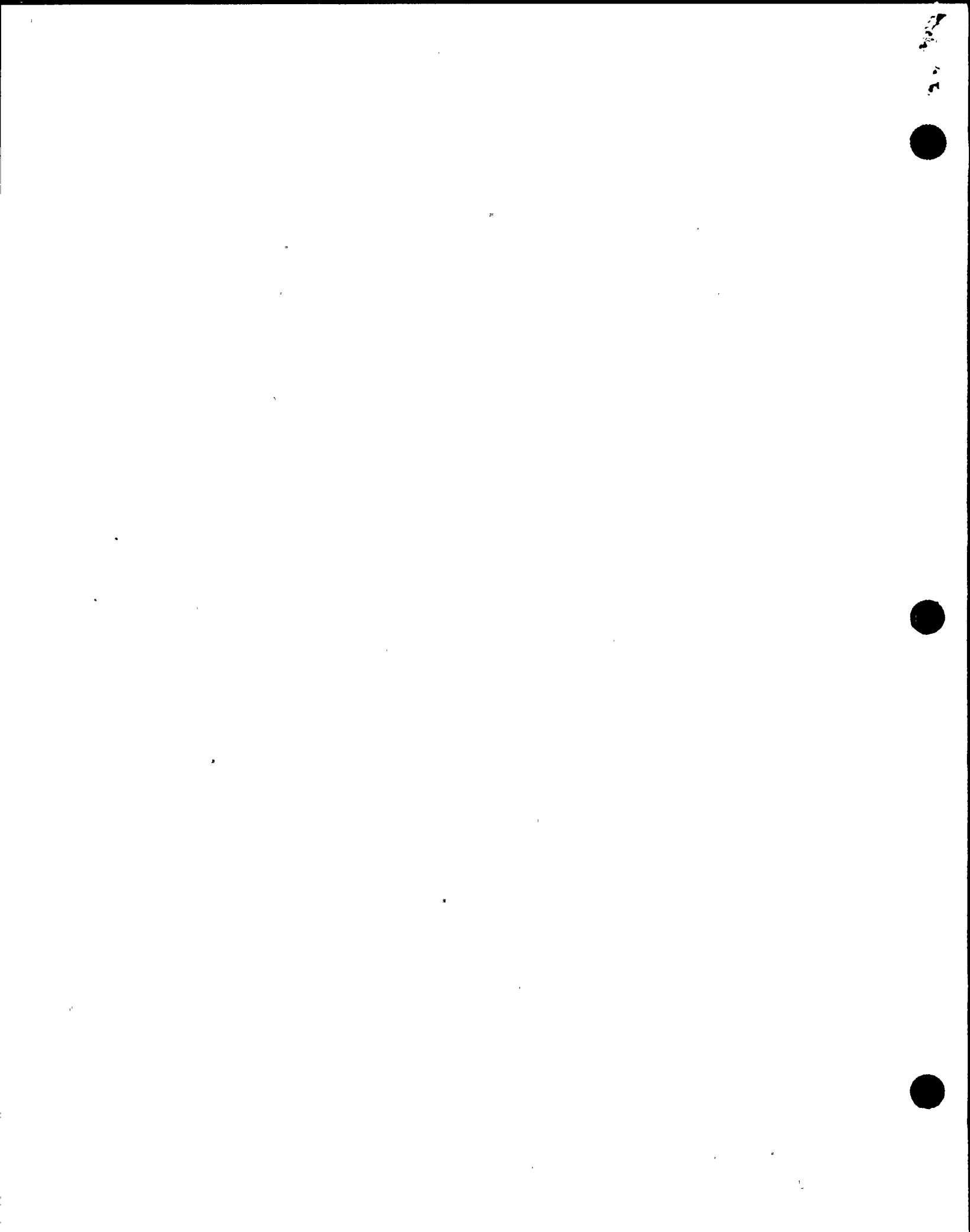
VERIFICATION: _____
DATA ENTRY: _____

RECORDS: _____

CONFIDENTIAL
DOCUMENT

9305060376 911031
PDR ADDOCK 05000410
S PDR

374

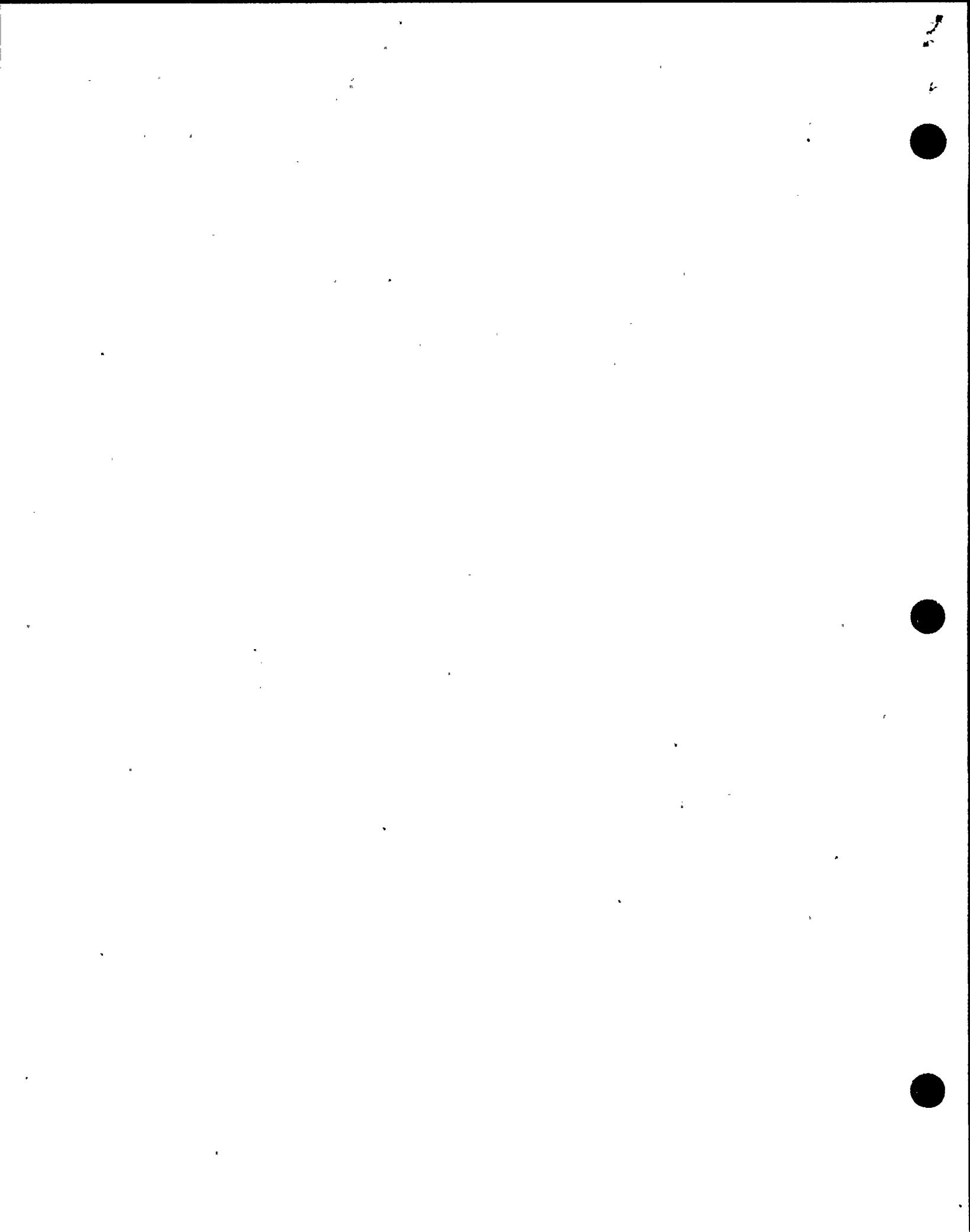


I. TRAINING DESCRIPTION

- A. Title of Lesson: Remote Shutdown System
- B. Lesson Description: Provide instruction in the function and operation of plant equipment associated with the Reactor Shutdown System. Emphasis is placed on knowledge and activities normally associated with Auxiliary Operator duties in the plant.
- 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/facilitated discussion should be conducted in the classroom.
- F. Prerequisites:
 - 1. Instructor:
 - a. Certified in accordance with NTP-16.
 - 2. Trainee:
 - a. In accordance with NTP-12.
- G. References:
 - 1. N2-OP-78 Remote Shutdown System
 - 2. NMPC-2 USAR
 - a. Vol. 16, Sect. 7.4
 - 3. 10CFR
 - a. Part 50, Appendix R

II. REQUIREMENTS

- A. Requirements for class:
 - 1. INPO NLO Guidelines
 - 2. NTP-12



III. TRAINING MATERIALS [(*) optional]

A. Instructor Materials:

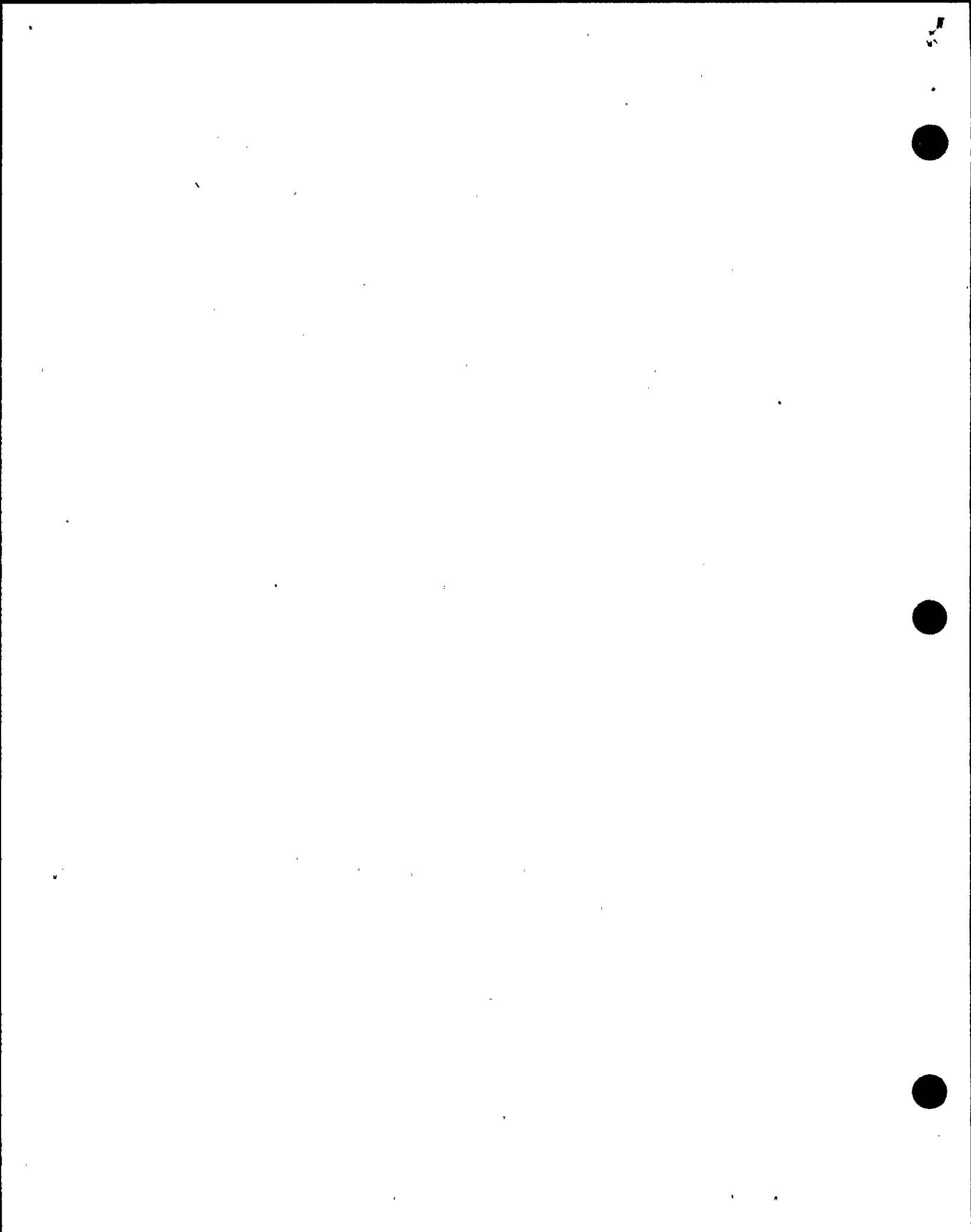
1. Whiteboard, markers, erasers
2. Transparencies
3. Overheat Projector
4. Working copy of this lesson plan
5. Scientific calculator (*)
6. Handouts, worksheets with answer keys (*)
7. Student text
8. Films
9. Flipchart (*)
10. Training Record
11. Evaluation sheets

B. Trainee Materials:

1. Text
2. Pens, pencils, paper
3. Binders (*)

IV. EXAMS AND MASTER ANSWER KEYS

- A. Exams and answer keys will be on permanent file in the Records Room.



V. LEARNING OBJECTIVES

A. Terminal Objectives:

Upon satisfactory completion of this lesson the trainee will demonstrate the knowledge to:

TO-1.0 Perform the actions of the in-plant "C" Operator during any Control Room evacuation.

B. Enabling Objectives:

EO-1.0 Explain the purpose and function of the Remote Shutdown System.

EO-2.0 List the major components of the Remote Shutdown System.

EO-3.0 Given a list of major components of the Reactor Shutdown System, describe the purpose and function of the major components.

EO-4.0 Regarding the Remote Shutdown System, 1) Locate the correct drawing and 2) Use drawings to perform the following:

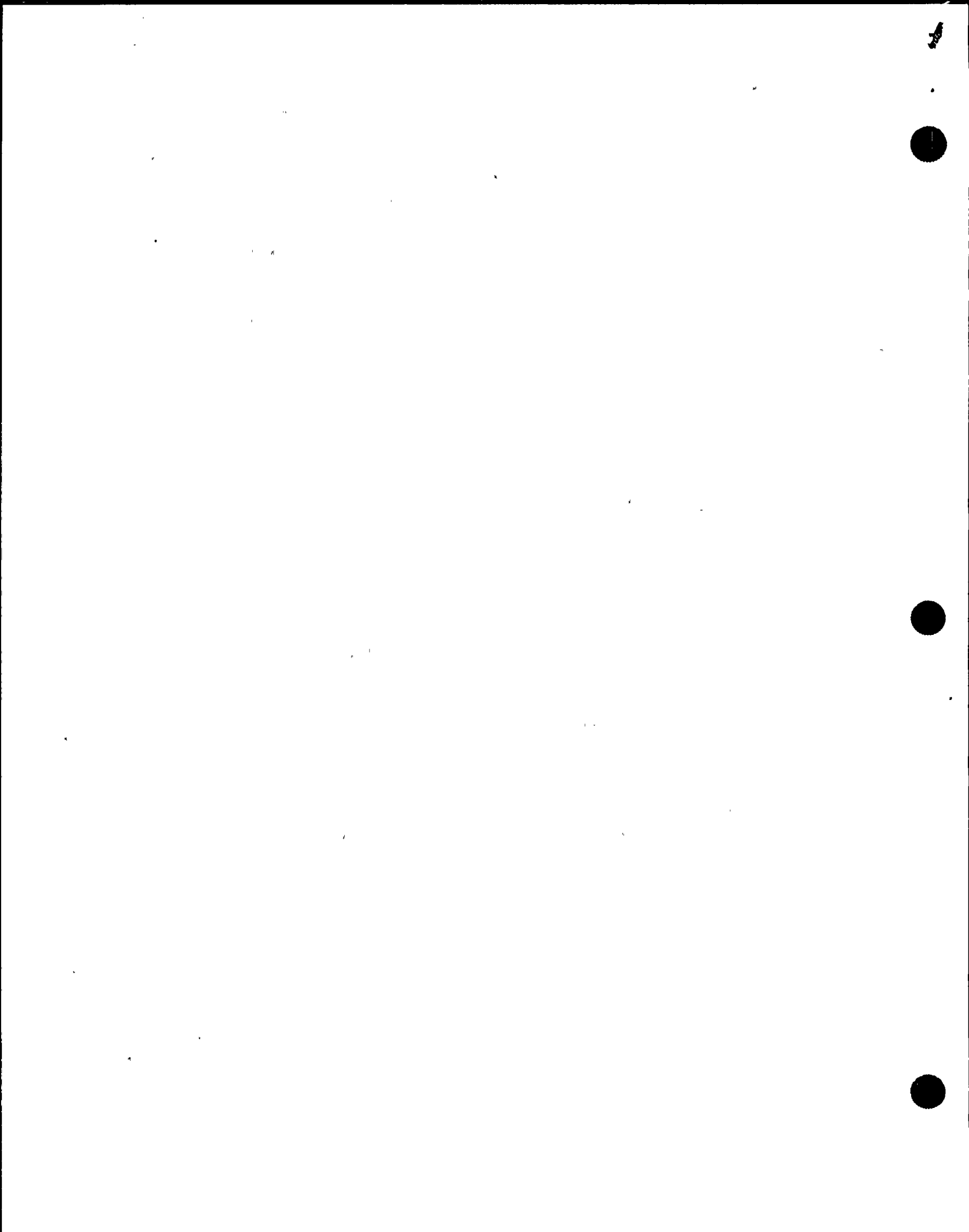
- a. Identify electrical and mechanical components.
- b. Trace the flowpath of fluids or electricity.
- c. Identify interlocks and setpoints.
- d. Describe system operation.
- e. Locate information about specific components.
- f. Identify system interrelations.

EO-5.0 List the systems that interrelate with the Remote Shutdown System and describe that interrelationship.

EO-6.0 For the precautions and limitations listed in N2-OP-78 explain the basis for each precaution and limitation.

EO-7.0 Regarding the Remote Shutdown System, determine and use the correct procedure to identify the actions and/or locate information related to NLO duties for the following:

- a. Start up
- b. Normal operation
- c. Shut down
- d. Off normal operation
- e. Correcting alarm conditions



I. INTRODUCTION

A. Student Learning Objectives

B. Purpose

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 values 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.

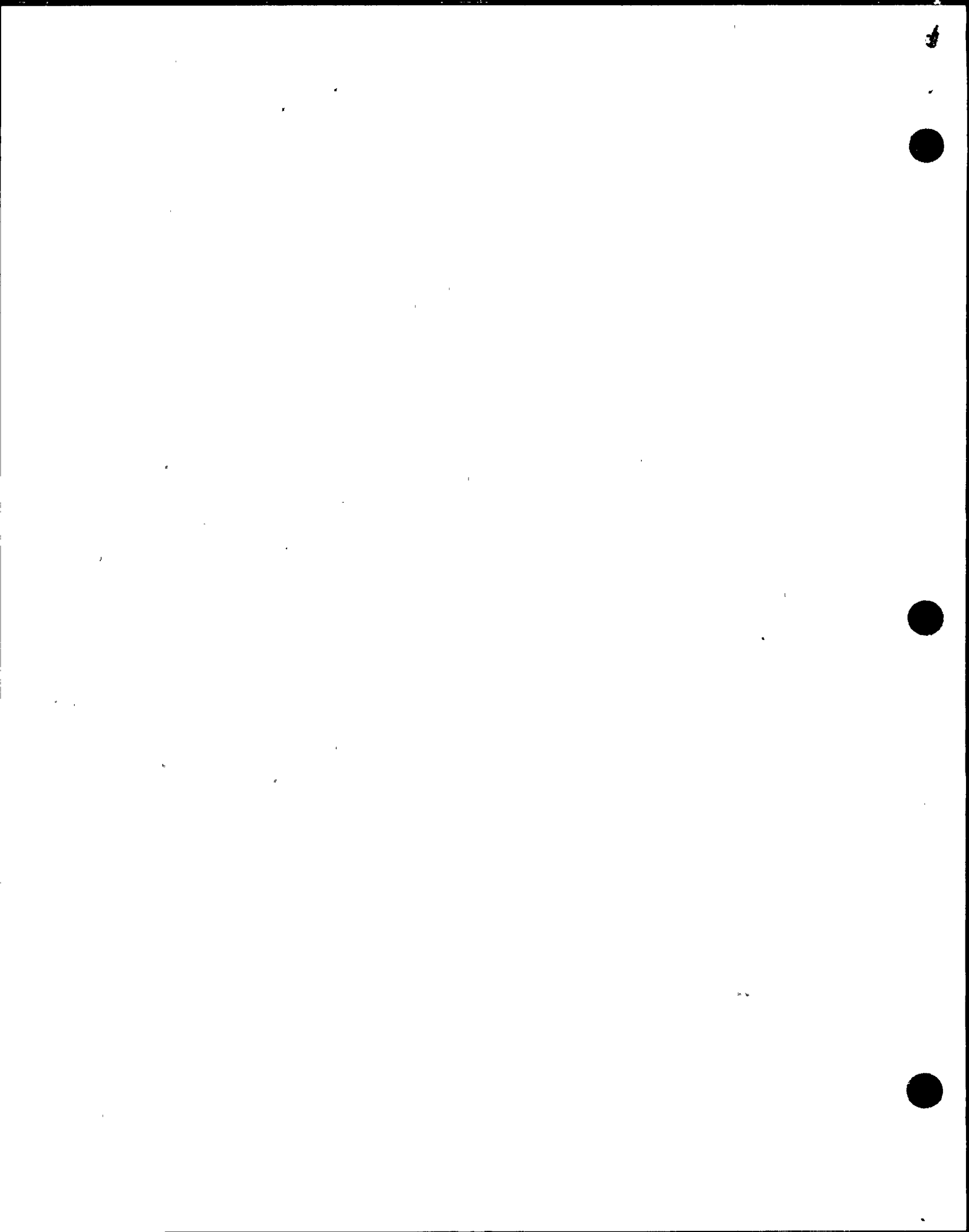
Discuss evaluation criteria and critique sheet completion with trainees.

Show transparency of the objectives and discuss as necessary

EO-1.0

Design criteria from 10CFR50 Appendix A Criterion 19.

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

EO-2.0

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

2CES*PNL405 & 406

405 is the Div. I side

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

406 is the Div. II side

- 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

Show overhead of panel layout and discuss as required with trainees.

EO-4.0

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'.

Keys for the transfer switches kept in the RSP Room.



B. Remote Shutdown Panel

1. RCIC System (ICS)

EO-5.0

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.

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

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.

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-5.0

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

EO-5.0

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

EO-5.0

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.

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

- 2) Printer driven by process computer.

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

- 3) Gaitronics console.

EO-5.0

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.
- ANN 601420 Division I Remote SHTDN XFER Switch Emer. Position EO-6.0
- 1) The MCR switches are disabled. ANN 601510 Division II Remote SHTDN XFER Switch in Emer. POSN.
- 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.



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.

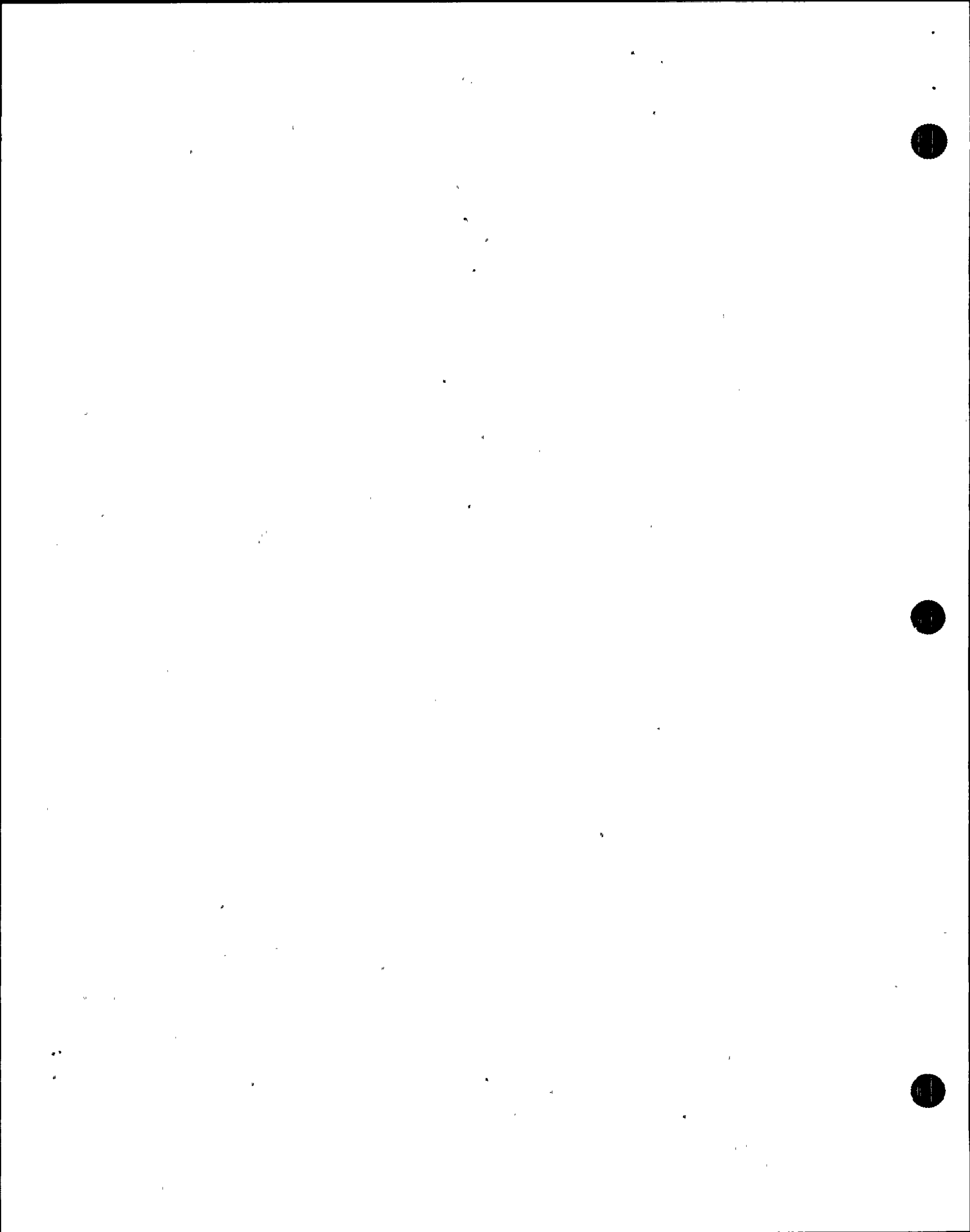
Refer table 3 for each switches function.

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.

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



- 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.

Handout copies of N2-OP-78 and review precautions EO-6.0 and limitations bases with the trainees. EO-7.0
Review system operations as outlined.

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.



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.

As a review go over system interrelations.

EO-5.0



- 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.



VI. RELATED PLANT EVENTS

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

VII. SYSTEM HISTORY

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

VIII. WRAP-UP

- A. Review the student learning objectives.

