

NINE MILE POINT NUCLEAR STATION

UNIT #2 OPERATIONS

LESSON PLAN

62-REQ-001-263-2-00-4

PLANT DC ELECTRICAL DISTRIBUTION

MASTER CONTROLLED DOCUMENT

07-191-91

Prepared by: Unit #2 Training Department

<u>APPROVALS</u>	<u>SIGNATURES</u>	<u>DATE AND INITIALS</u>
Training Supervisor Nuclear-Unit #2 G. L. Weimer	<u>[Signature]</u>	<u>1/23/89 [Initials]</u>
Assistant Training Superintendent-Nuclear R. T. Seifried	<u>[Signature]</u>	<u>RS 1/23/89</u>
Superintendent Operations-Unit #2 R. G. Smith	<u>[Signature]</u>	<u>1/23/89 [Initials]</u>

Summary of Pages

Revision: 4 (Effective Date: 1/23/89)

Number of Pages: 11

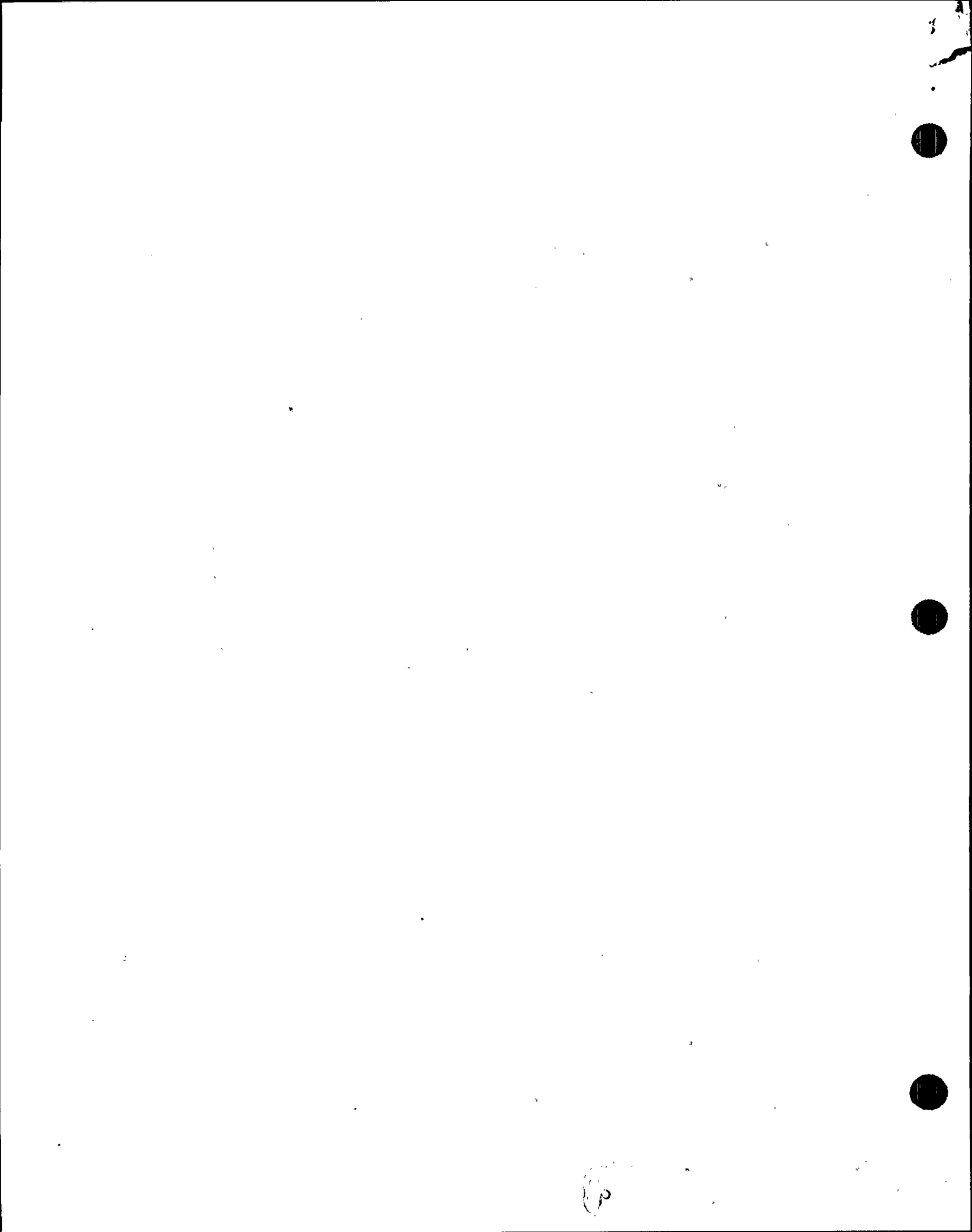
Date \_\_\_\_\_ Pages \_\_\_\_\_

January 1989

CONTROLLED DOCUMENT

THIS LESSON PLAN IS A GENERAL REWRITE

CONTROLLED DOCUMENT  
NIAGARA MOHAWK POWER CORPORATION



ATTACHMENT 5  
LESSON PLAN TEMPORARY/PUBLICATION/ADDENDUM CHANGE FORM

The attached change was made to:

Lesson plan title: Plant DC Distribution System

Lesson plan number: 02-RSQ-001-263-2-00

Name of instructor initiating change: Pat Walsh

Reason for the change: To include SOER 83-5 as a reference

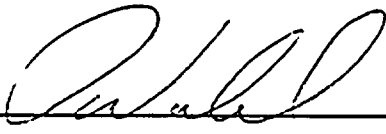
Type of change:

1. Temporary change
2. Publication change
3. Addendum change

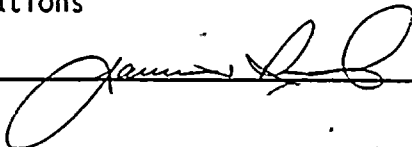
Disposition:

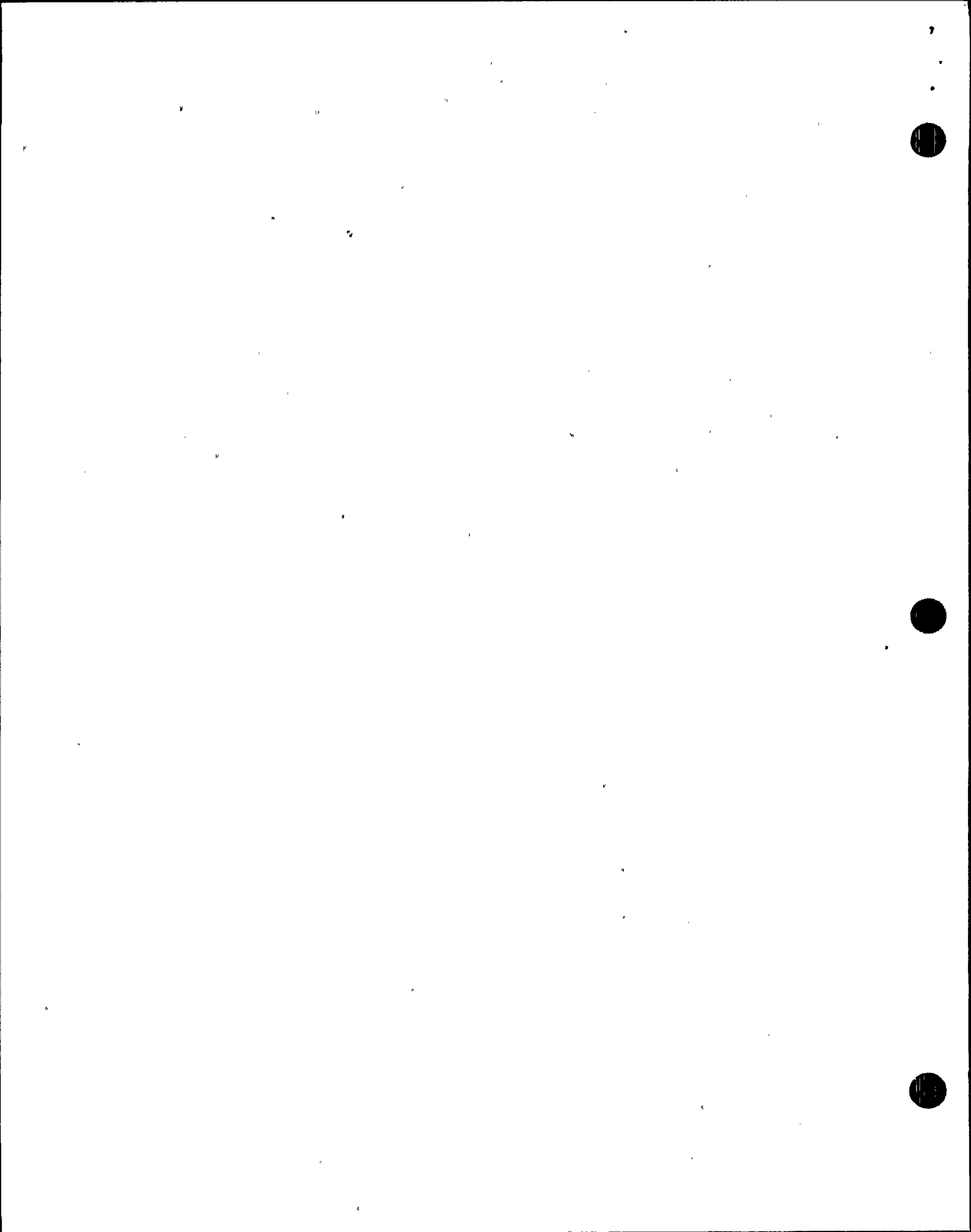
1. Incorporate this change during the next scheduled revision.
2. Begin revising the lesson plan immediately. Supervisor initiate the process.
3. To be used one time only.

Approvals:

Instructor:  /Date 7/26/91

Supervisor Operations  
Training  
(or designee):

 /Date 7/26/91



OBJECTIVE APPROVAL

Author: UNIT II OP'S TRAINING

Training Dept: Unit II OPS.

Lesson Title: PLANT DC ELECTRICAL DISTRIBUTION

Lesson Plan #: NZ - OLP - 68

Training Setting(s): Classroom

Purpose: INSTRUCTOR shall present information for the student to meet each student learning objective. Additionally, he shall provide sufficient explanation to facilitate the student's understanding of the information presented.

Trainee Job Title: Senior Licensed Operator Candidate  
LICENSED OPERATOR CANDIDATE  
NON-LICENSED OPERATOR TRAINING  
LICENSED OPERATOR REQUALIFICATION

Approvals/Review

Signatures

Date

Training Supervisor

[Signature]

1/20/89

Plant Supervisor

[Signature]

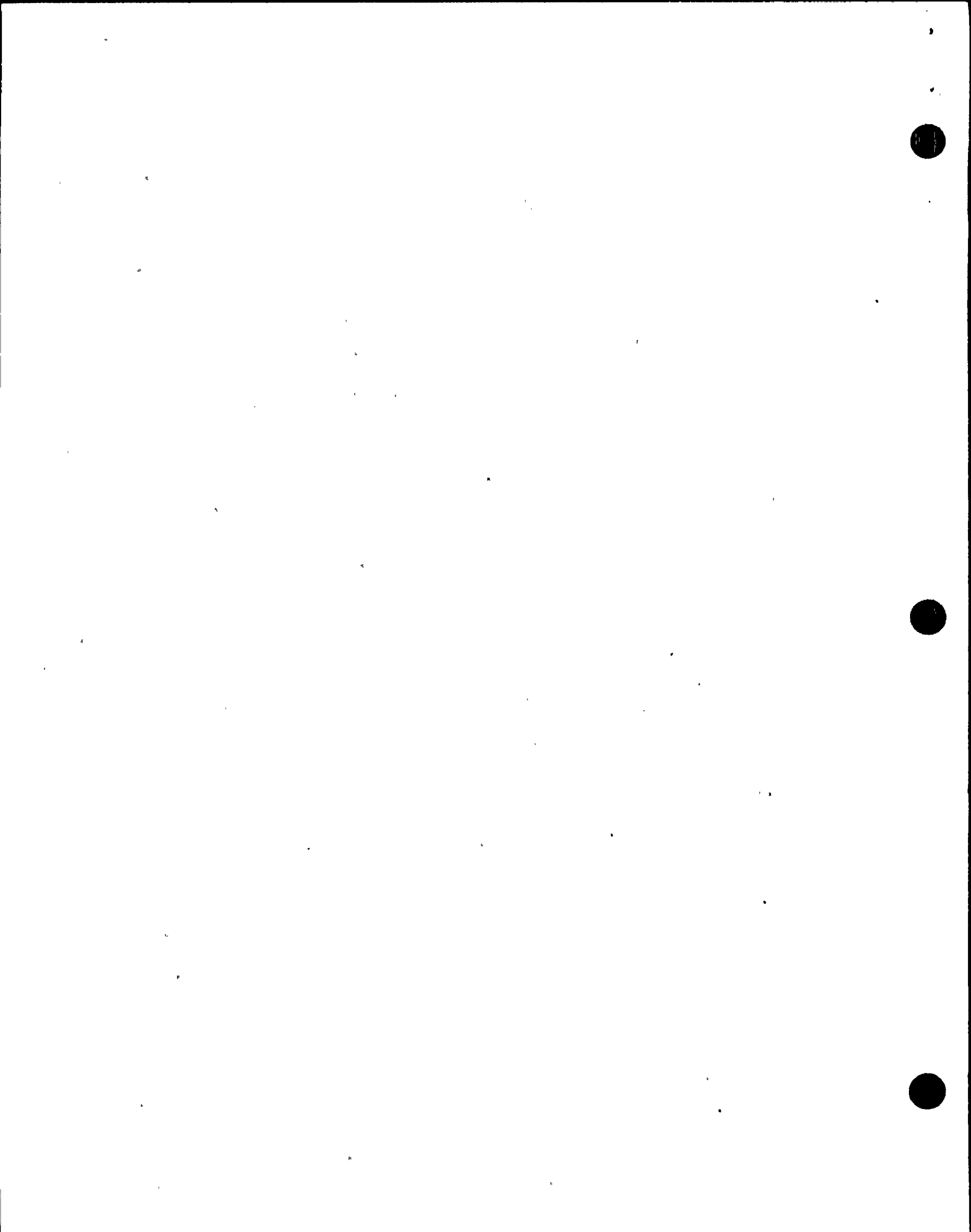
1/23/89

Training Analysts Supervisor

[Signature]

1-20-89

When complete, attach this form to the master lesson plan.



## I. TRAINING DESCRIPTION

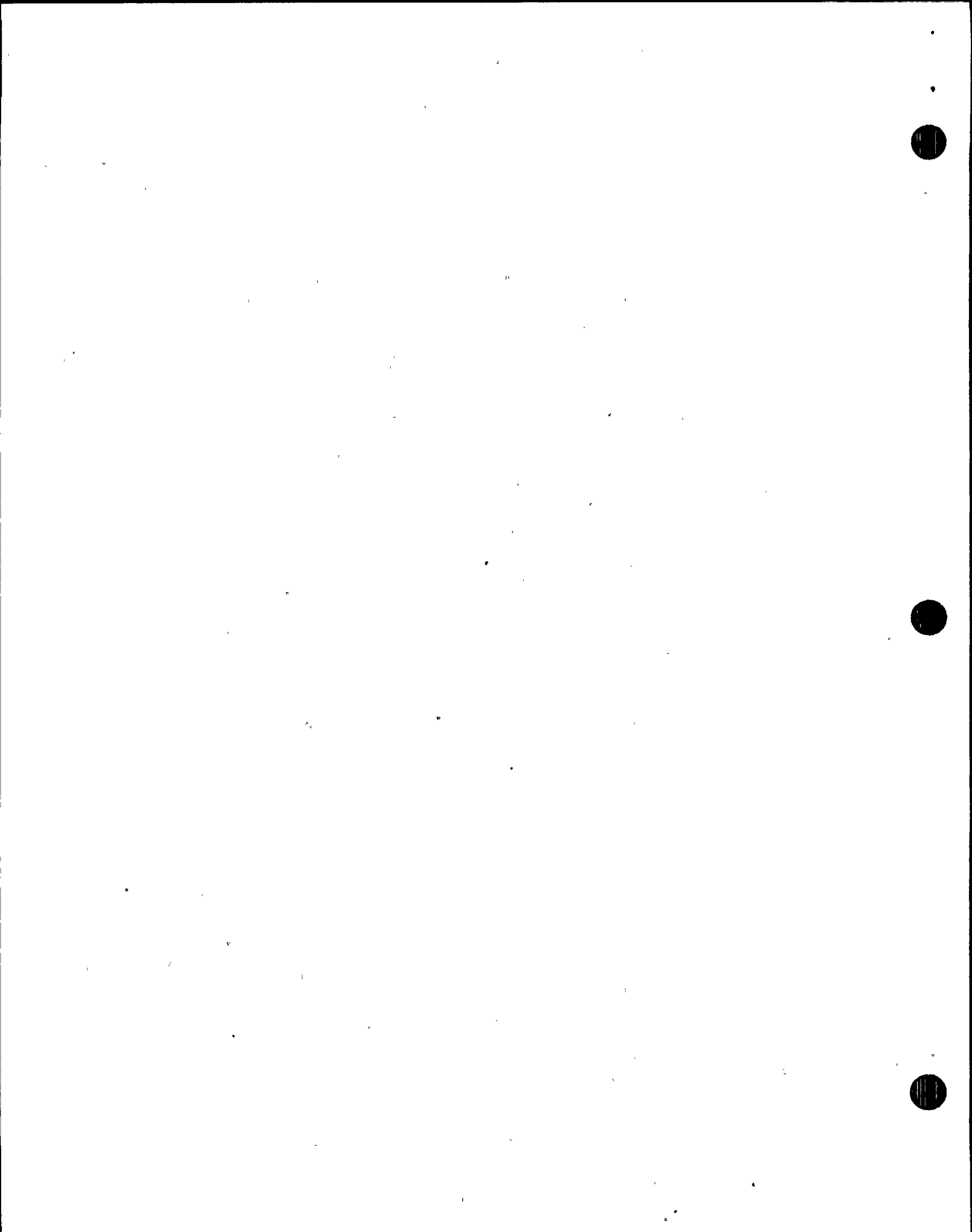
- A. Title: N2-OLP-68, Plant DC Electrical System
- B. Purpose: In a lecture presentation, the instructor shall present information for the student to meet each Student Learning Objectives. Additionally, he shall provide sufficient explanation to facilitate the student's understanding of the information presented.
- C. Estimated Duration: Approximately 1.5 hours
- D. Training Methods:
- Classroom Lecture
  - Assign the Student Learning Objectives as review problems with the students obtaining answers from the text, writing them down and handing them in for grading.
- E. References:
1. Technical Specifications
    - a. 3/4.8.2, DC Sources
    - b. 3/4.8.2, Onsite Power Distribution Systems
  2. Procedures
    - a. N2-OP-73A, "Normal DC Distribution"
    - b. N2-OP-73B, 24V DC Distribution
    - c. N2-OP-74A, Emergency DC Distribution
    - d. N2-OP-74B, HPCS 125V DC Distribution
  3. NMP-2 FSAR  
Design Basis Volume 16, Chapter 8, Page 8.354

*See* 4. SOER 83-5 (TRR - 600801-09)

## II. REQUIREMENTS AND PREREQUISITES

- A. Requirements for Class:
1. AP-9, Rev. 2, "Administration of Training"
  2. NTP-10, Rev. 4, "Training of Licensed Operator Candidates"
  3. NTP-11, Rev. 5, "Licensed Operator Retraining and Continuing Training"
  4. NTP-12, Rev. 3, "Unlicensed Operator Training"
- B. Prerequisites:
1. Instructor
    - a. Demonstrated knowledge and skills in the subject, at or above the level to be achieved by the trainees as evidenced by previous training or education, or

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- b. SRO license for Nine Mile Point Unit Two or a similar plant, or successful completion of SRO training including simulator certification at the SRO level for Nine Mile Point Unit Two.
  - c. Qualified in instructional skills as certified by the Training Analyst Supervisor.
2. Students
    - a. Meet eligibility requirements per 10CFR55, or
    - b. Be recommended for this training by the Operations Superintendent or his designee or the Training Superintendent.

### III. TRAINING MATERIALS

#### A. Teaching Materials:

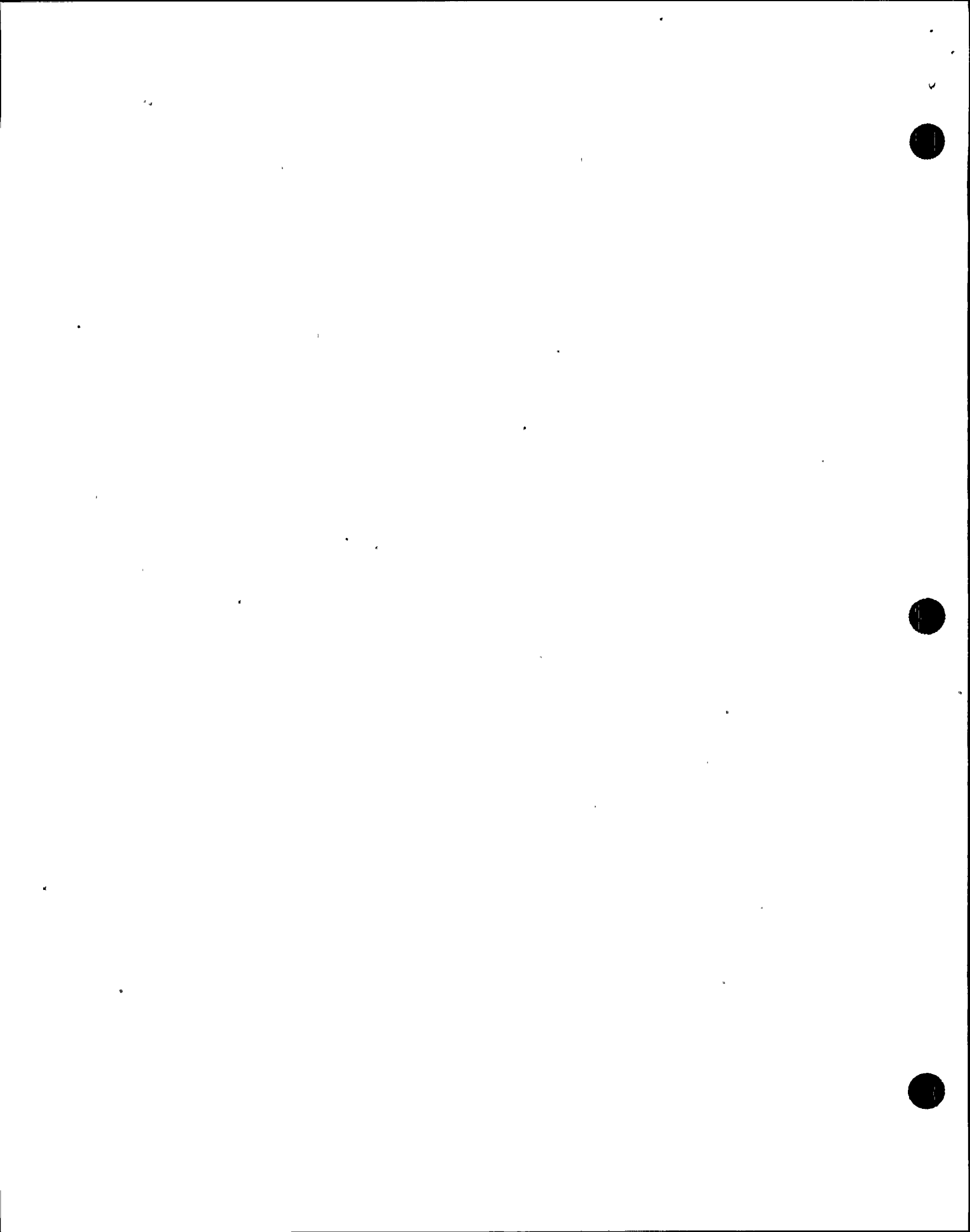
1. Transparency Package
2. Overhead Projector
3. Whiteboard and Felt Tip Markers
4. N2-OLP-68
5. N2-OLT-68
6. See Section I.E.1
7. See Section I.E.2

#### B. Student Materials

1. N2-OLT-68
2. See Section I.E.1
3. See Section I.E.2

### IV. EXAMINATIONS, QUIZZES AND ANSWER KEYS

- A. Will be generated and administered as necessary. They will be on permanent file in the Records Room.



V. STUDENT LEARNING OBJECTIVES FOR THE PLANT DC ELECTRICAL DISTRIBUTION SYSTEM (DCPS)

Upon completion of this chapter, mastery of the required system knowledge will be demonstrated by performing the Enabling Objectives listed below.

- 68-1 State the Purpose of the DC Electrical Distribution System.
- 68-2 List the division and the corresponding color coding of each of the safety-related divisions of the 125VDC emergency DC system.
- 68-3 List the safety related 125VDC system loads on Division I, II, III and the 24 VDC system loads.
- 68-4 List the source of power (by bus number) for all battery chargers.
- 68-5 State the conditions and the length of time under which a battery charger can recharge its associated batteries from the design minimum charge to the fully charged state.
- 68-6 List the non-safety related 125 VDC buses.
- 68-7 List the DC Electrical System support systems.
- 68-8 Given N2-OP-73A, 73B, 74A, and/or 74B, identify the appropriate actions and/or locate information related to:
  - a. Start-Up
  - b. Normal Operations
  - c. Shutdown
  - d. Off Normal Operation
  - e. Procedures for Correcting Alarm Conditions
- 68-9 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 Plant DC Electrical Distribution System.



VI. LESSON CONTENT

Text Text  
Ref. Ref.  
Page Fig. S.L.O.

I. INTRODUCTION

Student Learning Objectives

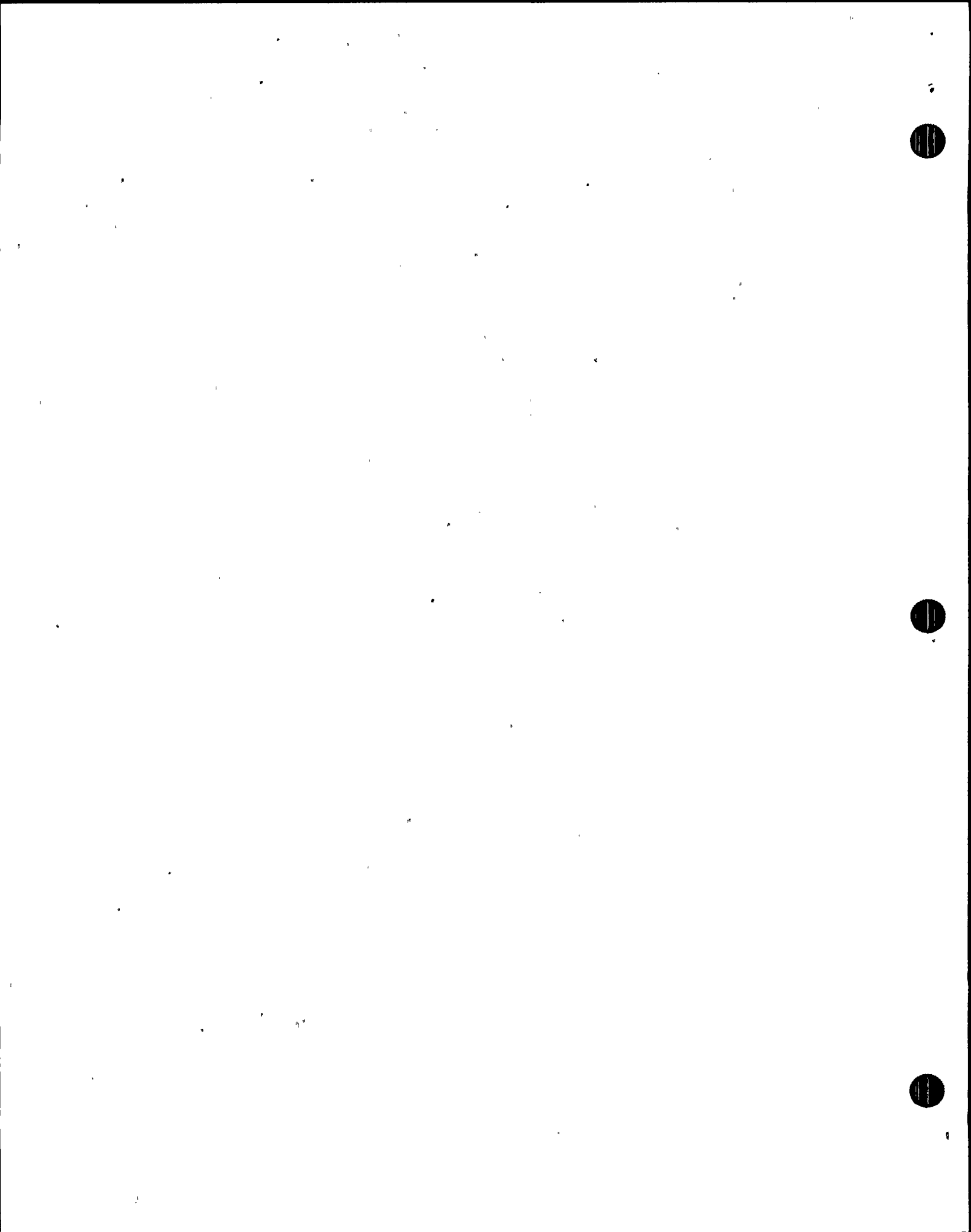
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A. Purpose

1

1

The normal 125VDC system provides a reliable DC source of power for DC control power circuits, instrumentation, DC motors, and other essential DC loads required during normal and abnormal conditions of the plant. The 24VDC system provides a reliable DC source of power for the Source and Intermediate Range Neutron Monitoring systems. The 125VDC emergency power system provides a highly reliable source of continuous power to safety-related control, instrumentation and other essential DC loads required during normal plant conditions and safe reactor shutdown under all postulated Design Basis Accident (DBA) conditions.



Activity

B. General Description

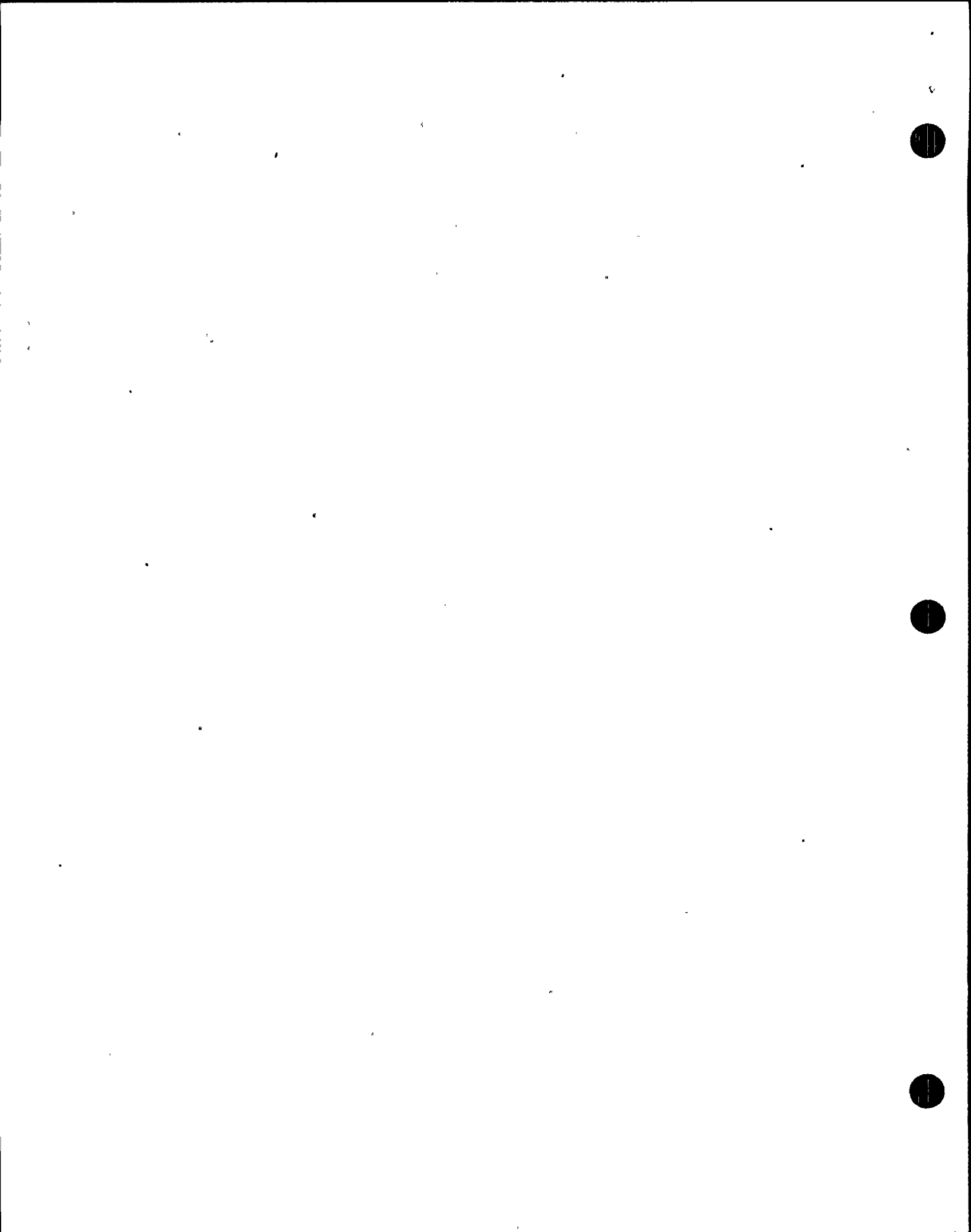
Use Figures 1,2, and 3 to describe the Plant DC Distribution System

1. Plant distribution consists of:
  - a. Emergency (safety related) DC system
  - b. Normal (non-safety related) DC system
  
2. Emergency DC system
  - a. Three physically separate and electrically independent divisions corresponding to the divisions of Emergency AC (ENS, EJS)
  - b. Each division of DC System supplies DC loads associated with corresponding AC System.
  
3. Normal DC system (125VDC, ±24VDC) 2
  - a. 125VDC system supplies:
    - normal switchgear
    - main transformer
    - reserve station service transformers
    - aux boiler transformer
    - other non-safety related loads
  - b. Three separate 125 VDC buses
  - c. Two ± 24 volt batteries  
Each supplies a separate bus.

II. DETAILED DESCRIPTION

A. Safety-Related DC Systems (Class 1E)

1. Emergency DC Power System (BYS, BWS) are designated Div I, II, III corresponding directly to Essential AC Power System (ENS, EJS) Divisions I, II, III.

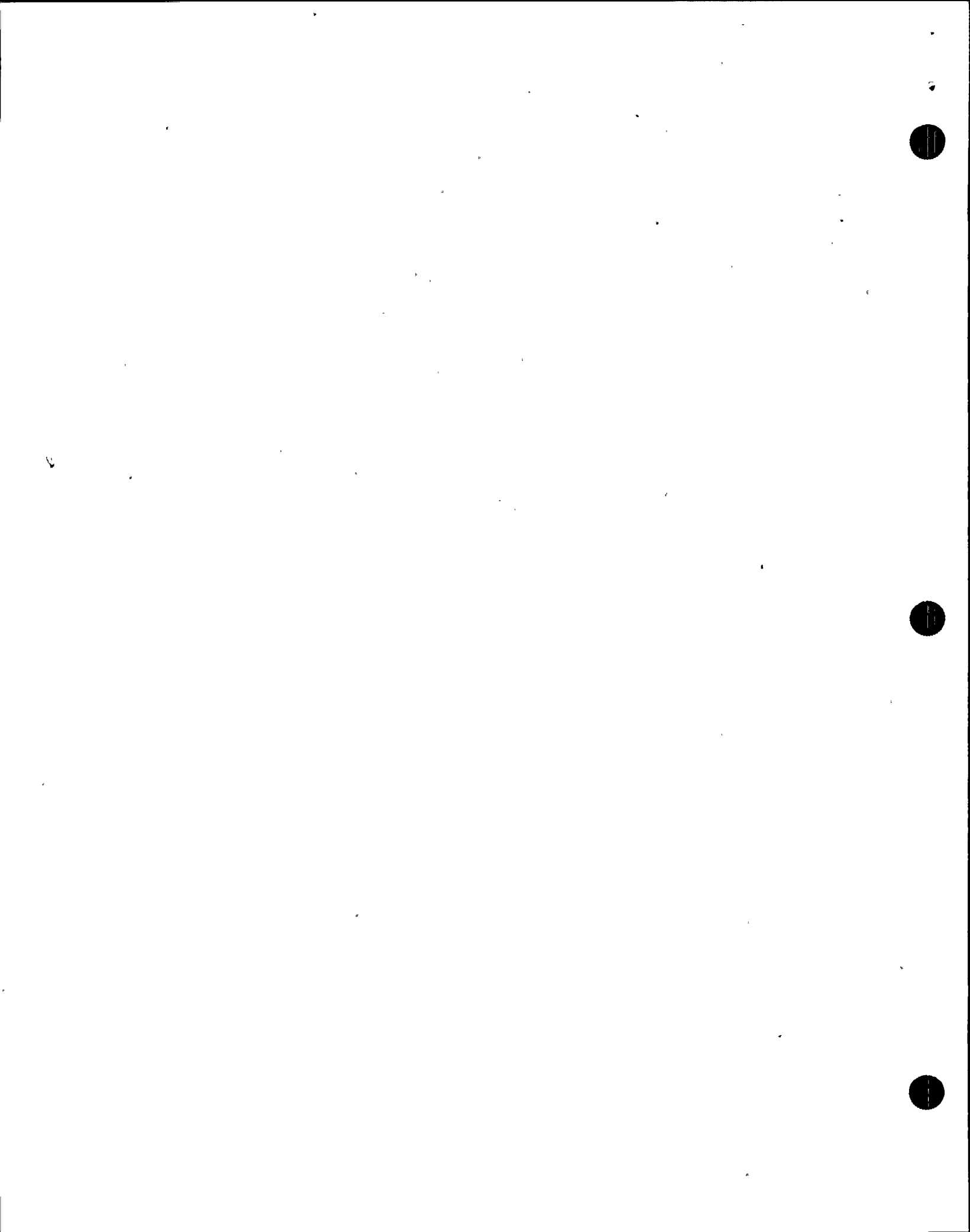




<u>Activity</u>	<u>Text Ref. Page</u>	<u>Text Ref. Fig.</u>	<u>S.L.O.</u>
2. Color Coded:	2		2
a. Green (Div I)			
b. Yellow (Div II)			
c. Purple (Div. III)			
3. For loads see Table 1			3
4. Div I/II(2BYS*BAT2A/B) batteries			
a. Calcium grid lead acid batteries			
b. 125VDC			
c. 2550 amp-hrs(8 hrs. rating)			
5. Div III (2BYS*BAT2C)	3		
a. Data <u>same</u> Div I/II except 100amp-hrs(8 hrs. rating)			
6. Chargers (two 100% cap. chargers for each division.)			
7. Div I/II Chargers sized to recharge the battery bank from minimum charge to full charge within 24 hours while supplying steady-state DC Loads.			5
2BYS*CHGR2A1/2(DIV I)			
2BYS*CHGR2B1/2(Div II)			
a. Convert 600 VAC to 125VDC 300 amp (continuous rating).			



<u>Activity</u>	<u>Text Ref. Page</u>	<u>Text Ref. Fig.</u>	<u>S.L.O.</u>
8. Div I/II power supplies Div I CHGR2A1-600VAC PNL 2LAC*PNL100A Emergency Lighting Panel CHGR2A2-600VAC PNL 2EJS*PNL100A Emergency Distribution Panel Div II CHGR2B1-600VAC PNL 2LAC*PNL300B Emergency Lighting Panel CHGR2B2-600VAC PNL 2EJS*PNL300B Emergency Distribution Panel	3		4
9. Div III Chargers a. 50 amp (continuous) capacity (other data same as Div I/II)  b. 125VDC output for 600VAC input.			
10. Div III Power Supply *CHGR2C1 and 2C2 are supplied from emergency MCC 2EHS*MCC201			4
B. <u>Emergency 125VDC switchgear</u>	4	1A,1B	
1. Div I/II (batteries, chargers and breakers) are connected to switchgear 2BYS*SWG002A/B through a CKT breaker.			
2. Div III (battery, chargers and breakers) is connected to 2CES*IPL414.		1C	
3. Emergency switchgear buses are ungrounded 2000 amp rated, with manually operated air circuit breakers (Div III bus rated for 100 amps).			



Activity

C. Nonsafety-Related DC Power System

-(Non-class 1E, required for normal plant operation but not safe shutdown) components identified by black color or NO-color coding.

1. Consists of normal 125VDC system and normal  $\pm 24$ VDC system.
2. Normal 125VDC system (3 subsystems A, B, C)

<u>600VAC BUS</u>	<u>Charger</u>	<u>Battery</u>	<u>Switchgear</u>	
2NJS-US5	2BYS-CHGR1A1	2BYS-BAT1A	2BYS-SWG001A	4,6
2NJS-US6	2BYS-CHGR1B1	2BYS-BAT1B	2BYS-SWG001B	
2NJS-US6	2BYS-CHGR1C1	2BYS-BAT1C	2BYS-SWG001C	

3. Normal 125VDC system feeds all non safety related (non-class 1E) DC instrumentation, control and other DC loads.
4. Normal  $\pm 24$ VDC system

3 4

<u>600VAC BUS</u>	<u>Charger</u>	<u>Battery</u>	5
(Thru 600/240 transformers)			
2NJS-PNL500	2BWS-CHGR3A1	2BWS-BAT3A	
	2BWS-CHGR3C1	2BWS-BAT3C	
2NJS-PNL600	2BWS-CHGR3B1	2BWS-BAT3B	
	2BWS-CHGR3D1	2BWS-BAT3D	

5.  $\pm 24$ VDC system feeds all DC neutron monitoring system loads, and consists of two 24V batteries, chargers, distribution panels.



Activity

D. Nonsafety-Related DC System Load

Text  
Ref.  
Page  
5

Text  
Ref.  
Fig.

S.L.O.

1. 125 VDC system consists of three subsystems, each having its own battery bank, charger, and switchgear.
2. Each charger (125VDC, 500 amp) can supply rated loads (excluding UPS loads) and charge batteries from minimum to full charge within 24 hours.
3. With the chargers out of service, each battery bank supplies enough power to operate all required loads for two hours.

5

E. Nonsafety-Related 24 VDC Power System

6

1. Provides two redundant DC power sources for Neutron Monitoring System and Emergency Response facility optical isolators.
2. Chargers (24VDC 25 amp) are capable of recharging from minimum to full load within 24 hours while supply normal system loads.
3. Each battery bank can supply enough power to operate all required loads for four hours with a charger out of service.
4. Each system consists of a three wire bus, two 24 VDC batteries, and two chargers. One battery is connected between the positive and common ground, the other between the negative and common ground.

5





Activity  
III. INSTRUMENT, CONTROLS AND INTERLOCKS

A. Instrumentation

1. Safety-related 125VDC Power Distribution system.
  - a. Control room back PNL-852 has indication of Bus volts and amps and charger volts and amps.
  - b. Switchgear has indication of bus volts and amps.
2. Nonsafety-related 125VDC
  - a. Control room back PNL-852 has indications of battery and charger amps and bus current.
3. Normal  $\pm 24$ VDC
  - a. Control room back PNL-852 has indications of battery and charger amps and bus current.

B. Controls

7

1. One ground detection control switch and pushbutton are provided for each battery on back PNL-852. Test pushbutton used with control switch in normal position for ground indication.

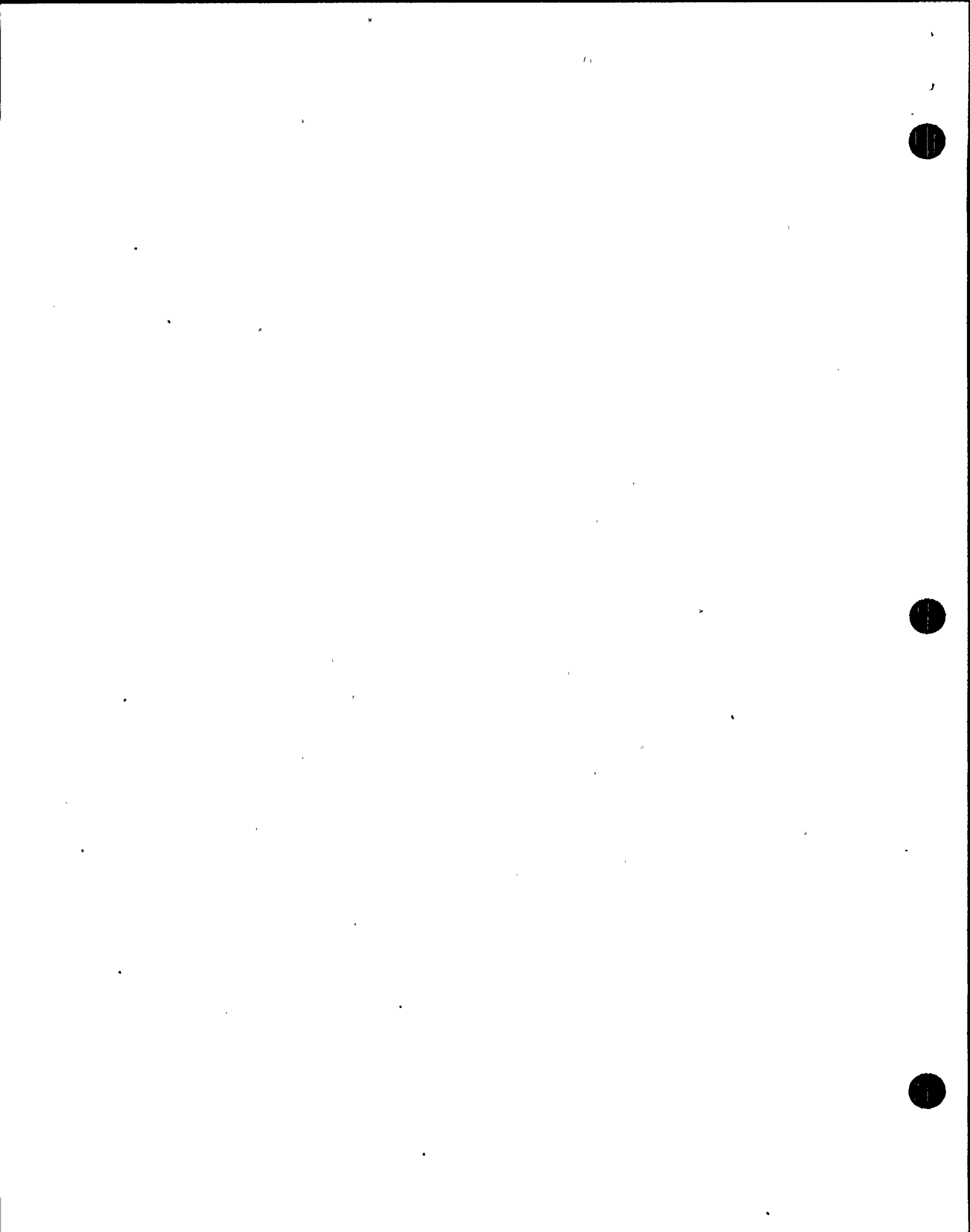
C. Interlocks

1. Div. I, II, III chargers have an over-voltage circuit which disconnects the AC input to the chargers when the DC output voltage exceeds a manually present valve.

IV. SYSTEM OPERATION

A. Normal Operation

1. Safety Related 125VDC
  - a. All breakers closed: chargers supplying power, batteries on "float"



<u>Activity</u>	<u>Text Ref. Page</u>	<u>Text Ref. Fig.</u>	<u>S.L.O.</u>
2. Normal 125VDC and 24VDC	7		
a. All breakers are closed and the batteries on float charge.			
 V. <u>SYSTEM INTERRELATIONS</u>	 8		
A. Each battery room has smoke detection fire protection, sufficient ventilation to limit hydrogen accumulation and maintain room temp between 65-104°F, and adequate lighting for inspection and maintenance.			7
B. AC power is supplied to DC systems through chargers as listed on pages 7 and 8.			
 VI. <u>DETAILED SYSTEM REFERENCE REVIEW</u>			
Review each of the following referenced documents with the class.			
A. <u>Technical Specification</u>			9
1. DC Sources                   LCO 3.8.2			
2. Onsite Dist System   LCO 3.8.3			
B. <u>Procedures</u>			8
N2-OP-73A Normal DC Dist			
N2-OP-73B 24VDC Dist			
N2-OP-74A Emerg DC Dist			
N2-OP-74B HPCS 125VDC Dist			
 VII. <u>RELATED PLANT EVENTS</u>			
A. Refer to Addendum "A" and review related events with the class, (if applicable).			
 VIII. <u>SYSTEM HISTORY</u>			
A. Refer to Addendum "B" and review related modifications with the class, (if applicable).			
 IX. <u>WRAP-UP</u>			
A. Review the Student Learning Objectives.			

