NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION

UNIT II OPERATIONS

02-REQ-006-344-2-04 Revision 4

TITLE: EMERGENCY OPERATING PROCEDURES, PRIMARY CONTAINMENT PRESSURE CONTROL (PCP)

	SIGNATURE	DATE
PREPARER	[signature]	10/11/90
TRAINING SUPPORT SUPERVISOR	[signature] for J. LeClair with TCO-02-REQ-90-178	10/12/90
TRAINING AREA SUPERVISOR	[signature]	10/12/90
PLANT SUPERVISOR/ USER GROUP SUPERVISOR	[signature]	10/12/90

MASTER CONTROLLED DOCUMENT

Summary of Pages

Effective Date: 10/12/90

Number of Pages: 22

Date	Pages
October 1990	22

THIS LESSON PLAN IS A GENERAL REWRITE

TRAINING DEPARTMENT RECORDS ADMINISTRATION ONLY:

VERIFICATION: ____________ ______

DATA ENTRY: ____________ ______

RECORDS: ____________ ______

4/29/18

I. TRAINING DESCRIPTION

A. Title of Lesson: Emergency Operating Procedures, Primary Containment Pressure Control (PCP

B. Lesson Description: This lesson plan discusses actions taken to control Primary Containment pressure.

C. Estimate of the Duration of the Lesson: Approximately 2 hours

D. Method of Evaluation, Grade Format, and Standard of Evaluation:

1. Written examination with 80% minimum passing grade.

E. Method of Setting of Instruction:

1. Classroom Lecture

2. Assign the Student Learning Objectives as review problems with the students obtaining answers from the text, writing them down and handling them in for grading.

F. Prerequisites:

1. Instructor:

a. Certified in accordance with NTP-16 or NTP-16.1.

2. Trainee:

a. In accordance with NTP-10 or NTP-11 or

b. Be recommended for this training by the Operations Superintendent (or designee) for the Training Superintendent.

G. References:

1. BWROG Emergency Procedure Guidelines, Rev. 4

2. Plant Procedure N2-EOP-PCP

II. REQUIREMENTS

A. Requirements for class:

1. AP-9, Administration of Training

2. NTP-10, Training of Licensed Operator Candidates

3. NTP-11, Licensed Operator Requalification Training

III. TRAINING MATERIALS

A. Instructor Materials:

1. Transparency Package
2. Overhead Projector
3. Whiteboard and Felt Tip Markers
4. EOP Flowchart for PCP

B. Trainee Materials:

1. EOP Flowchart for PCP
2. OLP-PCP

IV. EXAM AND MASTER ANSWER KEYS

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

V. LEARNING OBJECTIVES

A. Terminal Objectives:

TO-1.0 Given conditions requiring the use of the Emergency Operating Procedure, use the procedure to place the plant in a stable condition as prescribed in the procedure.

B. Enabling Objectives:

EO-1.0 State the purpose of the Primary Containment Pressure Control Procedure.

EO-2.0 State the entry conditions for the Primary Containment Pressure Control Procedure.

EO-3.0 Given the procedural step, discuss the technical basis for that step.

I. INTRODUCTION

A. Student Learning Objectives

B. Purpose

1. This procedure specifies the operator actions necessary to control and maintain Primary Containment pressure below that which would threaten Primary Containment integrity. — EO-1.0

C. Procedure Overview

1. The Primary Containment Pressure Control procedure is executed concurrently with the following procedures:

   a. N2-EOP-DWT Drywell Temperature Control

   b. N2-EOP-SPT Suppression Pool Level Control

   c. N2-EOP-SPL Suppression Pool Level Control

   d. N2-EOP-PCH Primary Containment Hydrogen Control

2. Concurrent execution is necessary because:

   a. The actions taken to control any one parameter may directly effect control of the others.

b. This procedure is based on the symptomatic approach to emergency response, where the initiating event of the transient is not known in advance. Assignment of priorities to any one of the five parameters is therefore not possible.

3. The values and trends of <u>parameters</u> and the status of <u>plant equipment</u> during the even will dictate the order of execution of each flowpath (procedure).

II. DETAILED DESCRIPTION

A. Entry Conditions — EO-2.0

1. Setpoints

a. The conditions which require entry into this procedure are:

1) Suppression Pool temperature above 90°F.
   - Most limiting pool temperature addressed by Technical Specifications.

2) Drywell temperature above 150°F.
   - Drywell limiting temperature as specified by Tech. Specs.

3) Suppression Pool water level above El. 201 ft.
   - Maximum LCO pool level by Tech. Specs.

4) Suppression Pool water level below El. 199.5 ft.
   - Minimum LCO pool level by Tech. Specs.

5) Drywell pressure above 1.68 psig.
   - Limiting Safety System Setting for drywell pressure by Tech. Specs.
     - ALSO: ECCS setpoint & entry into RPV control.

6) Primary Containment hydrogen concentration above 1.8%.
   - H_2/O_2 Analyzer alarm setpoint.

b. The occurrence of any one of these conditions requires entry into this procedure.

c. If an entry condition clears prior to exiting this procedure, and then re-occurs; re-entry at the beginning of the procedure is required.

d. If a second entry condition occurs while performing the procedure, re-entry at the beginning is again required.

e. If all entry conditions clear while executing this procedure, this procedure may be exited.

f. Termination of the emergency rather than termination of an event is the basis for exiting conditions for EOP's. Consequently, these procedures may be exited at any point during their execution if the operator determines that an emergency no longer exists. The EOP's have been written so that if an operator remains in a procedure when an emergency no longer exists, they still provide proper guidance. Alternately, if the operator exits, a procedure prematurely, reoccurrence of an entry condition will follow and the appropriate EOP procedure will be re-entered. (TMR#02-88.232)

2. Setpoint Basis

   a. The values selected were chosen on the basis of being simple, readily identifiable and operationally significant. They also provide advance warning of potential emergency conditions, allowing action to be taken which may prevent more severe circumstances.

B. Procedural Steps

1. Execute EOP-SPT, DWT-PCH, PCP and SPL concurrently,

   a. As previously discussed, concurrent control of all five containment parameters is required when taking action to control any one of them.

2. Monitor and control Primary Containment pressure below 1.68 psig using SBGT (OP-61A, Section H.1).

   - There are two causes for a Primary Containment pressure increase: EO-3.0

     1) Loss of coolant accidents due to breaks inside the drywell, and

     2) Loss of drywell cooling.

- Provides a smooth transition from general plant procedures to EOPs.
- Assures normal methods have been employed prior to more complex actions. EO-3.0

3. WAIT until Primary Containment pressure cannot be maintaining below 1.68 psig.

- Delaying the performance of the subsequent actions in this procedural leg confirms that the SBGT System is unable to maintain Primary Containment pressure scram setpoint and that further control actions need to be addressed. EO-3.0
- Allows the diverting of the operators attention to the parameter of concern is Primary Containment pressure is NOT the problem, BUT not to ignore this parameter either.
- 1.68 psig is also entry condition for RPV Control.

4. While executing the following steps
   IF
   Suppression Pool sprays have been initiated
   AND
   Suppression Chamber pressure drops below 1.68 psig
   THEN
   Terminate Suppression Pool Sprays — EO-3.0

   - Assures that Primary Containment pressure is not reduced below atmospheric. Maintaining a positive Primary Containment pressure assures that a safe margin to the negative design pressure (-4.7 PSID) of the Primary Containment exist.

5. BEFORE - Suppression Chamber pressure reaches 10 psig. (Suppression Chamber Sprays)

   - Suppression Pool spray will reduce Primary Containment pressure by condensing steam and by absorbing energy from non-condensibles in the Suppression Chamber. — EO-3.0

- The Suppression Pool spray initiation pressure is defined to be the minimum Suppression Pool Chamber pressure which results from transferring 95% of the non-condensibles from the drywell to the Suppression Pool.
- Maintaining Suppression Chamber pressure below Suppression Chamber Spray Initiation Pressure (10.57 psig) precludes "chugging" (oscillating steam condensation at the downcomer vents).

  EO-3.0
- Chugging is a phenomenon where the non-condensibles (to ~ 97 - 98% steam environment), have been purged from the drywell to the Suppression Pool and steam is still being injected through the downcomers. At the low steam flow velocities associated with small break LOCA's gross condensation instabilities at the downcomer exit can result.

  Note: As little as 1% non-condensible can prevent this.
- Chugging imposes large cyclic stresses on the downcomers which could result in failure, and bypassing the pressure suppression function of the Suppression Pool.

6. Is the Suppression Pool below El. 217 ft.?
   a. YES - continue at STEP # 8
   b. NO - continue at STEP # 9
      - This step evaluates Suppression Pool level to determine if Suppression Pool spray operation is permissible. EO-3.0
      - The spray nozzles become submerged at EL. 217 ft. EO-3.0

7. Initiate Suppression Chamber Sprays.
   - Use only RHR pumps which do not have to be run continuously in the LPCI mode for adequate core cooling.
      - Maintaining adequate core cooling takes precedence over initiating Suppression Pool sprays because catastrophic failure of the Primary Containment is not expected to occur at the Suppression Chamber Spray Initiation Pressure. EO-3.0
      - This step does permit alternating pumps, from RPV injection to sprays.

- Instructions for terminating Suppression Pool spray operation were provided by a previous override step.

8. While executing the following steps:

   IF

   Drywell sprays have been initiated

   AND

   Drywell pressure drops below 1.68 psig

   THEN

   Terminate drywell sprays

   - This is done to ensure that Primary Containment pressure is not reduced below atmospheric. EO-3.0

9. WAIT until Suppression Chamber pressure exceeds 10 psig.

   - Confirms that Suppression Pool sprays were unable to reduce Primary Containment pressure. EO-3.0

10. Is Suppression Pool water level below El. 217 ft.

    a. YES - continue at STEP #12

    b. NO - continue at STEP #13

       - The Suppression Chamber-to-drywell vacuum breaks are submerged. EO-3.0

11. Are the drywell pressure and temperature below the Drywell Spray Initiation Pressure Limit? (Fig. PC-3)
    a. NO - continue at STEP #11
        - Drywell spray operation is not permitted because the negative design differential pressure limit (-10 PSID) between the drywell and Suppression Chamber or the high drywell pressure scram setpoint may be exceeded, by the evaporative cooling pressure drop. EO-3.0
    b. YES - continue below
        1) Trip recirculation pumps
        2) Trip drywell cooling fans
        3) Initiate drywell sprays (EOP-6, Att. 22)
            - Use only RHR pumps which do not have to be run continuously in the LPCI mode for - adequate core cooling.
            - Before drywell spray is initiated the operator must ensure that the restrictions imposed by Fig. PC-3 are satisfied. EO-3.0

- Spray initiation above these limits is not allowed.
- Initiating drywell sprays will redistribute air through the drywell vacuum breakers and avoid chugging.
- Recirc pumps and drywell coolers are shutdown to prevent electrical damage.

12. Wait until

a. Suppression Chamber pressure cannot be maintained below the Pressure Suppression Pressure (Fig. PC-3).

- The Pressure Suppression Pressure (Fig. PC-4) is defined to be the lesser of: EO-3.0

1) The highest Suppression Chamber pressure which can occur without steam in the Suppression Chamber air space or,

Note: Conditions 1 & 3 apply at NMP2.

2) The highest Suppression Chamber pressure at which initiation of RPV depressurization will not result in exceeding the PCPL before RPV pressure drops to the Minimum RPV Flooding pressure or,

3) The highest Suppression Chamber pressure which can be maintained without exceeding the Suppression Pool boundary design load if SRV's are opened. EO-3.0

4) Thus maintaining Suppression Chamber pressure below Figure PC-4 accomplishes the dual objectives of assuring proper operation of the pressure suppression function and limiting containment pressure to below the design limit.

13. Emergency Depressurization is required.

a. Do not exit this procedure. See RPV control, Section RP and contingencies C3 and C5 is applicable,

14. BEFORE - Suppression Chamber pressure reaches the Primary Containment Pressure Limit (Fig PC-4).

- Irrespective of the site radioactivity release rate, vent the Primary Containment IAW EOP-6, Att. 21, to reduce and maintain pressure below the Primary Containment Pressure Limit (Fig. PC-4).

a. Defeat Primary Containment isolation interlocks.

- Venting the containment is the only mechanism remaining to prevent an uncontrolled, unpredictable breach of containment integrity and the resulting release of radioactivity to the environment. EO-3.0
- Although venting will result in the release of some radioactivity to the environment, this is preferable to containment failure.

15. IF
Suppression Pool water level is below El. 217 ft.
THEN
Vent the Suppression Chamber EOP-6, Att. 21.
- Venting via the Suppression Chamber is the preferred method of Primary Containment venting because it takes advantage of the scrubbing effect as vented gas from the Primary Containment exiting the downcomer passes through the Suppression Pool water. The scrubbing effect minimizes the amount of radioactivity release. EO-3.0

16. IF
Suppression Pool water level is at or above El. 217 ft.
OR
The Suppression Chamber cannot be vented
THEN
Vent the drywell (EOP-6, Att. 21)

17. WAIT - until Suppression Chamber pressure cannot be maintained below the Primary Containment Pressure Limit (Fig. PC-4).

18. IF
Suppression Pool water level is below El. 217 ft.
THEN
Irrespective of whether adequate core cooling is assured, Initiate Suppression Pool sprays.

- This action is specified, because not doing so may eventually result in a complete and uncontrolled loss of Primary Containment integrity. EO-3.0
- No assurance exists as to where the containment may/will fail, loss of the Suppression Pool is assumed with a consequent complete and unrecoverable loss of core cooling. Subsequently, substantial amounts of radioactivity may be released in an uncontrolled manner to the general public.

19. IF

Suppression Pool water level is at or below El. 217 ft.

AND

Drywell temperature and pressure are within the Drywell Spray Initiation Pressure Limit (Fig. PC-3)

THEN

Irrespective of whether adequate core cooling is assured.

a. Trip recirculation pumps
b. Trip drywell cooling fans
c. Initiate drywell sprays — EO-3.0
   - This action is specified, because not doing so may eventually result in a complete and uncontrolled loss of Primary Containment integrity.

- No assurance exists as to where the containment may/will fail, loss of the Suppression Pool is assumed with a consequent complete and unrecoverable loss of core cooling. Subsequently, substantial amounts of radioactivity may be released in an uncontrolled manner to the general public.

- No assurance exists as to where the containment may/will fail, loss of the Suppression Pool is assumed with a consequent complete and unrecoverable loss of core cooling. Subsequently, substantial amounts of radioactivity may be released in an uncontrolled manner to the general public.

III. WRAP-UP

A. Summary

The Primary Containment Pressure Control procedure specifies actions for controlling and maintaining containment pressure below that which would threaten Primary Containment integrity.

The preferred method of pressure control utilizes the SBGT system, but if pressure continues to increase, Suppression Pool and drywell sprays may be used provided applicable restrictions are satisfied. If Primary Containment pressure cannot be maintained below specific limits using the SBGT and Suppression Pool and drywell sprays, other actions are specified to terminate or minimize pressurizing the Primary Containment form the RPV. These actions are taken at progressively high Primary Containment pressures and include, in sequence, depressurizing the RPV, venting the Primary Containment and spraying the Suppression Pool and drywell irrespective of whether adequate core cooling is assured.