NINE MILE POINT NUCLEAR STATION

UNIT II OPERATIONS

Ø7-189-91

LESSON PLAN

02-REQ-001-223-2-02.4

PRIMARY CONTAINMENT ISOLATION SYSTEM

Prepared By: Nine Mile Point Unit 2
Operations Training Staff

APPROVALS	SIGNATURES	DATE AND INITIALS REVISION 4
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Summary of Pages

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NIAGARA MOHAWK POWER CORPORATION

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Attachment "A"

OBJECTIVE APPROVAL

Author: R. Brown

Training Dept: Unit 2 Ops Trng

Lesson Title: Primary Containment Isolation System

Lesson Plan #: 132-CLP-21

Training Setting(s): ~~NLOT, LTC CLASS, REQUAL~~ Classroom

Purpose: The instructor shall present information for the student to meet each Student Learning Objective. Additionally, he shall provide sufficient explanation to facilitate the students' understanding of the information presented.

Trainee Job Title: ~~PLANT OPERATOR~~ NLOT Licensed Manipulator, Licensed Operator, Requal

Approvals/Review	Signatures	Date
Training Supervisor		4/7/89
Plant Supervisor		1/20/89
Training Analysts Supervisor		12-21-88

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

LESSON PLAN

I. TRAINING DESCRIPTION

A. TITLE: Primary Containment Isolation System |4

B. PURPOSE: In a lecture presentation, the 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.

C. TOTAL TIME: 4 Hours |4

D. TEACHING 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. 3/4.3.2 Isolation Actuation Instrumentation |4
   b. 3/4.4.7 Main Steam Line Isolation Valves |
   c. 3/4.6.3 Primary Containment Isolation Valves |

2. Procedures |
   N2-OP-83, Primary Containment Isolation System |

3. NMP-2 FSAR |
   Design Basis Vol. 14, Chapter 6.2 |

II. REQUIREMENTS AND PREREQUISITES |4

A. REQUIREMENTS FOR CLASS: |

1. AP-9, Rev. 2, Administration of Training |
2. NTP-10, Rev. 3, Training of Licensed Operator Candidates |
3. NTP-11, Rev. 4, Licensed Operator Retraining |
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 |4
   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-21 |4
5. N2-OLT-21 |
6. See Section I.E.1 |
7. See Section I.E.2 |

B. STUDENT MATERIALS:

1. N2-OLT-21 |4
2. See Section I.E.1 |
3. See Section I.E.2 |

IV. QUIZZES, TESTS, EXAMS AND ANSWER KEYS

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

V. LEARNING OBJECTIVES FOR THE CONTAINMENT ISOLATION SYSTEM |4

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

21-1 State the purpose of the Containment Isolation System. |4

21-2 Define type A, B and C process line containment penetrations. |

21-3 State what systems are isolated in each isolation group (Groups 1-9 only). |

21-4 For each isolation Group 1-9: |

a. List all signals which would cause an isolation function.

b. List the setpoint(s) for each automatic isolation function.

c. State when and how automatic functions are bypassed.

21-5 Describe the operation of the ISC manual isolation switches for each group isolation function. |4

21-6 Given N2-OP-83, Primary Containment Isolation System, use the procedure to identify the appropriate actions and/or locate information related to: |

a. Startup

b. Normal Operations

c. Shutdown

d. Off-Normal

e. Procedures for Correcting Alarm Conditions

21-7 (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 Primary Containment System.

VI. LESSON CONTENT

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
I. INTRODUCTION				
Student Learning Objectives	i			4
A. Purpose	1		1	
To limit the release of radioactive materials to less than that specified by regulatory guides.				4
B. General Description				
1. The ISC provides automatic and manual isolation of appropriate lines which penetrate the containment.				4
2. Process lines penetrating the containment are divided into three categories.			2	
a. Type A Lines with direct connection to RP vessel and penetrate primary containment.				4
b. Type B Lines that don't communicate directly with the RPV, but penetrate containment and communicate with free air space.			2	4
c. Type C Lines that penetrate primary containment but do not communicate directly with RPV or primary containment free air space.			2	
3. Types A and B will have inboard and outboard isolations,. Type C requires only an outboard isolation, (most have both).				
4. Check valves may be used as inboard isolations, but not outboard.				

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
II. DETAILED DESCRIPTION	2		
A. The isolation valves operated by ISC		3	
are divided into twelve groups:			4
1. Group 1 isolations			
a) MSIV's and steam line drains			
2. Group 2 isolations			4
a) Reactor water sample lines			
3. Group 3 isolations			
a) Auto TIP withdrawal and isolation valve closure			
4. Group 4 isolations			
a) RHS sample lines and RHS to radwaste			
5. Group 5 isolations			4
a) RHS shutdown cooling suction valves, RHS shutdown cooling injection valves, RHS reactor head spray valve			
6. Group 6 isolations			
a) WCS outboard isolation valves			
7. Group 7 isolations			
a) WCS inboard isolation valve			4
8. Group 8 isolations			
a. Containment Auxiliary Systems			4
1. CCP-RB closed loop cooling water			
2. CMS-Containment ATM monitoring			
3. ADS-Auto depressurization system air lines			
4. IAS-Instrument air			
5. LMS-Containment leakage monitoring			
6. Reactor recirc hyd power unit lines			
7. Drywell drains			
8. Hydrogen recombiner lines			
9. Drywell fire protection (deactivated)			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
10. Group 9 Isolations			3	
a. CPS Valves				
11. Group 10 Isolations	3			4
a. ICS Steam Supply Valves				
12. Group 11 Isolations				
a. ICS vacuum breaker isolation valves.				
13. Group 12 isolations				
a. Remote manually operated containment isolation valves				

B. Logic

1. Designed to automatically isolate two valves in each process line (inboard and outboard isolation valve). 4
2. Arranged in two divisions (I and II) with four channels (A, B, C, and D)
3. In general, ISC is arranged so that all outboard valves are controlled by Division I (Channel A and D). and all inboard valves are controlled by Division II logic (Channel B and C).
   a. Exceptions to this are:
      1. MSIV's
      2. H_2 Recombiners
      3. Containment monitoring
   b. MSIV's and MSL drains use one out of two taken twice logic.
      1. An MSIV closure signal closes both inboard and outboard valves.
      2. Only MSIV's use this logic.

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
4. Each division of logic is independent.	3		
a. No single failure can prevent the required automatic or manual operation of at least one valve of an inboard/outboard pair of isolation valves.			
5. All systems except MSIV's and the GTS radiation monitor require a minimum of two trip signals to cause a valve closure.	4		
a. Leak Detection System high temperature trips require only a single trip signal.			
C. Resets			
1. Isolation signals for Groups 1-10 seal-in and must be reset when signal clears.			
a. Groups 1-9 reset on panel 602.			
b. Group 10 reset on panel 601 (ICS) with keylock switches.			
D. Manual Isolation			5
1. Four Manual Isolation pushbuttons on panel 602.			
a. One button for each logic channel.			
b. Pushbuttons isolate Group 1-9.			
c. Each switch is an armed collar pushbutton.			
1. Actuation of any one switch will result in a half isolation signal only. (Does not shut any isolation valves).			

Activity		Text Ref. Page	Text Ref. Fig.	S.L.O.	
	2. Actuation of the A and C channel switches will deenergize the B solenoids for the inboard MSIV's and the A solenoids for the outboard MSIV's generating half isolation signal, (does not shut any isolation valves.)	4			4
	3. Actuation of the B and D switches will deenergize the A solenoids for the inboard MSIV's and the B solenoids for the outboard MSIV's generating a half-isolation signal, (does not shut any isolation valves).				
	4. Actuation of the A <u>and</u> B <u>or</u> C <u>and</u> D switches will close all eight MSIV's only, (no other groups isolate).				
	5. Actuation of the A and D switches will isolate all eight MSIV's. The outboard MSL drain isolation valves and the outboard isolation vales in Groups 2, 4, 6, 8 and 9.			5	
	6. Actuation of the B and C switches will isolate all eight MSIV's, the inboard MSL drain isolation valve, the inboard isolation valves in Groups 2, 4, 5, 7, 8 and 9, and will isolate Group 3.				
	7. Actuation of all four switches will fully isolated Groups 1-9.	5			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
2. Group 10 manual isolation is accomplished on panel 601 with a single pushbutton.	5			4
a. Group 10 manual isolation will only occur with a Reactor Core Isolation Cooling System initiation signal sealed in.				
3. Groups 11 and 12 have no group manual isolation capability.				
E. Group 1			4	4
1. Main steam isolation valves (MSIV)				
a. Provided to control loss of coolant from the RPV and the release of radioactive material to the environment.				4
b. Isolation always picks up both inboard and outboard isolation in contrast to other systems which may only pick up one or the other.				
2. Main steam line drains				
a. Same parameters cause isolation as with MSIV's.				
b. Drains do not use 1 of 2 taken twice logic.				
3. Isolation Signals				4
a. Steamline low pressure (766 psig) (bypassed when mode switch not in RUN).			4	4
1. Indicates failure of steam bypass and pressure control, prevents rapid depressurization and excessive cooldown.				
2. Sensed on each main steam line upstream of TSV's.				

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
b. Steamline area high temperatures	5		4	
1. High MSL Tunnel Temperature $\leq$ 159°F.				4
2. High MSL Tunnel $\Delta T \leq 50°F$.				
3. High MSL lead enclosure temperature $\leq$ 140°F.				
a. Detects small breaks outside containment not detected by steam line flow sensors.				
b. Indicates break of RCPB.				
c. Low condenser vacuum 8.5" Hg vacuum	6			
1. This isolation is bypassed with:				4
a. Mode Switch in startup, refuel or shutdown and,				
b. Main Turbine Tripped (TSV's closed) and,				
c. Main Condenser Low Vacuum B/P (panel 609 and 611 switches in bypass.				4
2. Indicates loss of primary heat sink and prevents over-pressurizing the condenser.				4
a. RPV triple-low level (+17.8")				
1. Indicates RCPB leak.				
2. Intended to keep level above TAF				
b. Main steam line high flow-103 psid. (any one line).	4		4	
1. High flow indicative of large down-stream break steampiping				4

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
2. Isolate break to:	6			4
a. Minimize inventory loss				
b. Limit rad release				
d. High main steam line radiation. (3x normal full power background).			4	
1. Indicates fuel failure.				
2. Prevents rad release.				4
3. Four detectors located in the vicinity of main steam lines in tunnel such that each detector senses radiation level of all four MSL's.				4
				4
F. Group 2				
1. Reactor Water Sample Valves				
a. Isolation is provided to control the possibility of a breach in the RCPB and/or radiological exposure to operating personnel near the sample station.				
b. Two logic channels cause an inboard valve isolation and two logic channels cause an outboard valve isolation.			4	
c. Isolate on RPV double-low level (108.8') or MSL hi-hi rad. (3xNFPB).				4
1. Low level indicates an RCPB break	5			
2. High rad prevents excess exposure near sample station.				

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
G. Group 3	7			4
1. Traversing In-Core Probe System				
a. Isolation is provided to control the possibility of a breach in the RCPB and/or radiological exposure to operating personnel.				
b. Isolation uses only two (B and C) of the four logic channels. A trip of both channels must occur to effect isolation.				
c. Isolation causes automatic withdrawal of TIP, isolation of ball valve and isolates indexer N_2 purge.			4	
d. Signals - double-low level (108.8") or Hi DW pressure (1.68 psig)				
1. Indicates breach in RCPB				
H. Group 4				
1. RHS Sample and Discharge to Radwaste Isolation				
a. Isolation is provided to provide integrity of A and B LPCI loops. Not primary containment penetration isolation valves.				
b. Two logic channels cause inboard isolation and two cause outboard isolation.				
1. Sample valves have override isolation for individual valves.				
c. Setpoints low water level (159.3") or High DW pressure (1.68 psig).			4	
1. Indicates vessel inventory loss or breach in RCPB.				

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
I. Group 5	8			4
1. RHS Shutdown Cooling and Reactor Head Spray Isolation				
a. Isolations are provided to prevent excessive reactor vessel inventory loss due to a leak in the RHS. In addition, a reactor pressure isolation is provided to prevent exceeding the system pumps maximum design high water temperature limits.				
b. The logic is arranged such that two channels will cause an inboard valve isolation and two channels will cause an outboard valve isolation.				
c. The outboard isolation will close the RHS head spray isolation valve, the RHS S/D cooling injection valve to A loop, and the outboard RHS shutdown cooling suction valve (MOV-113).				
d. The inboard isolation will close the RHS shutdown cooling injection valve to the B loop and the inboard RHS shutdown cooling suction valve (MOV-112).				
e. Setpoints				
1. Low water level (159.3")	8		4	
2. High reactor pressure (128 psig)				
3. RHS equipment area high temperature (135°F)				4.
4. High Reactor Building Ambient Temperature (130.2°F)				
5. Reactor Building Pipe Chase High Ambient Temperature (135°F)				

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
J. Group 6				4
1. Reactor Water Cleanup Outboard isolation Valve.	9			
a. Isolations are provided to isolate potential source of RCPB leakage, protect WCS components and support emergency system operation.				
b. The logic is arranged so that two channels will close the outboard isolation valve.				
c. Setpoints				
1. Any of the following Leakage Detection System (LDS) signal			4	
a. LDS power failure				
b. WCS area high temperature				
1. Pump Room A-135°F				
2. Pump Room B-150°F				
3. Heat Exchanger Room-135°F				
c. Reactor Building pipe chase high ambient temperature-135°F.				
d. WCS high differential flow suction to discharge flow paths-150.5 gpm for 45 seconds.				
2. SLC Pump A start or RRCS start of SLC pump.				
3. WCS filter demineralizer high inlet temperature-140°F.				
4. Low reactor water level-159.3" (level 3).				
K. Group 7 - WCS Inboard Isolation	10			
1. Reactor Water Cleanup System Inboard Isolation Valve				4
a. Similar to Group 6 except:			4	
1. Isolates inboard valve.				4
2. Group 7 does not isolate WCS on F/D high inlet temperature.				

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
3. SLC pump B or RRCS B actuation.	10			
L. Group 8				4
1. Containment Auxiliary Systems				
a. Isolation provides and maintain containment integrity.				
b. Isolation signals are double low (108.8") or high drywell pressure (1.68 psig).			4	
c. The logic is arranged so that two channels will cause an outboard isolation and two channels will cause an inboard isolation with the following exceptions:				
1. ADS instrument air lines only use outboard isolations. Two lines are divided between Division I and II.				
2. DBA H_2 recombiners and containment monitoring process lines are divided so that A train is isolated using Division I and B train is isolated using Division II.				
d. LOCA override switches are provided to allow individual valve control to be restored with an isolation signal present.			4	
1. Overrides provided for:				
a. CMS valves				
b. DBA H_2 supply recombiners				
c. IAS to SRV accumulators				
d. ADS nitrogen supply lines				
e. CCP to DW unit coolers				

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
e. Individual systems within the group can also be isolated using manual isolation switches on panel 602. The system which can be individually isolated are: 1. IAS to Drywell 2. DBA H_2 Recombiners 3. DW Floor Drains 4. Leakage Detection 5. DW Equipment Drains 6. CMS 7. CCP to DW Coolers	11		5	4
M. Group 9				
1. Containment Purge System				
a. Isolation provides containment integrity and limits radioactive release to environment.				
b. Isolation occurs on double low level (108.8"), high drywell pressure (1.68 psig), or high radiation on standby gas treatment discharge to the stack (5.7×10^{-3} mCi/cc).			4	
c. The logic is arranged so that two channels will cause an outboard isolation and two channels will cause an inboard isolation.				
d. The Group 9 valves can be isolated as an individual group using the containment manual isolation switches on panel 602.				

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
e. The containment purge valves have LOCA override switches which will remove the isolation signal to the containment inlet solenoid operated purge valves and the suppression chamber outlet vent valves as well as lineup nitrogen to operate the suppression chamber inboard outlet valve (AOV-109).	12		4	|4
1. LOCA override only overrides high drywell or double low level isolation.				
N. Groups 10-12				
1. Group 10 - RCIC Steam Supply Valve				
2. Group 11 - RCIC Vacuum Breakers				
3. Group 12 - Remote Manual Valves				|4
a. These Isolations are discussed in individual system chapters.				
O. Post Accident Monitoring System (PAMS)				
1. PAM recorder charts shift to fast speed on reactor double-low level (108.8"), or reactor high pressure (1050 psig).				
2. Each recorder has a reset pushbutton to return it to normal speed when the fast speed initiating signals clear.				|4
III. INSTRUMENTATION, CONTROLS AND INTERLOCKS	12			
A. Instruments				
1. Inputs to this system are provided from other reactor plants systems.				

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
B. Indications	12		
Control Room			
1. PAMS level/pressure recorder (panel 601)			|4
2. Off-Normal Status Board (panel 602)			|
a. Primary containment mimic shows valves on all process lines penetrating containment.			|
b. Light-On indicates valve out of normal position.			|
c. Amber status lights are available for potential problems with main steam or WCS portion of the ISC system.			|4
3. Excess flow valves position (panel 602)			
a. Close at >5 gpm; reset <1 gpm.			|4
b. Light-On indicates valve closed.			|
4. Amber logic seal in light are above individual manual isolation switches.			|
5. Inboard (outboard) valve relay panel, (panel 622/623).			|4
a. White indicating lights- indicate trip of inboard valve logic during testing.			
b. Following systems tested:			
- MSL drains inboard logic			
- Gps 3, 8 inboard logic			
- WCS inboard logic			
- Water level inboard logic			
- MSL inboard logic			
C. System Annunciators	13		
1. 603-Rx parameters that cause isolations.			
2. 602-Inop status of ISC system.			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
D. Controls	14			
1. 4 manual isolation switches on panel 602.				
2. PAM Recorder reset on panel 601.				
3. Logic Reset pushbuttons for Groups 1-9 on panel 602.				4
4. Group 10 logic reset keylock switches are located on panel 601.				
5. Isolation logic test switches and MSL low vacuum bypass switches are located on panels 611/609.				
E. Interlocks				4
1. MSL Low Pressure Group one isolation bypassed with mode switch out of run.			4	
2. Low Condenser Vacuum Group one isolation bypassed with mode switch out of run, TSV less than 95% open and bypass switches on panels 609/611 in the bypass position.			4	
3. The WCS system high differential flow isolation is bypassed for 45 seconds on system startup to allow for flow stabilization.			4	
4. Leakage Detection System bypass switch (panel 632/642) will bypass the WCS high differential flow, all high area temperature isolations and the power failure test pushbuttons, if pushed.				
5. Power failure test pushbuttons (panel 632/642) test power loss to containment isolation logic. With LDS bypass switch in bypass will result in power loss annunciators only.				

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
IV. SYSTEM OPERATION	15		5	
A. Normal Operation				
1. Normally automatic function system energized and trips reset.		Table 1		4
2. Loss of power to ISC results in isolation.				
B. Testing				
1. Tests conducted by single channel (panel 609/611) without causing an isolation.				4
V. SYSTEM INTERRELATIONS	16			
A. AC Power				
1. UPS Bus A (Outbd) and Bus B (Inbd)				
2. PAM recorders receive 120 VAC power from A & B instrument bus.				
B. Leakage Detection System				
1. Provides room and area high temperature isolation signals to ISC Groups 1, 4, 5, 6, 7.				
C. Rx Vessel Inst.				
1. Provides ISC with signal inputs of Rx Vessel parameters (level, pressure)				
D. Standby Liquid Control				
1. Provides isolation signal to WCS upon SLS initiation				
E. Rx Protection System				
1. Provides isolation signals to ISC for parameters which also cause RPS trip (DW Press, MSL radiation)				
F. Condensate System				
1. Provides Main Condenser Vacuum signal.				

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
G. Main Steam System			
1. Provides steam line pressure and flow signals.	17		
2. ISC will isolate MSIV's and steam line drains.			
H. Radiation Monitoring System			
1. Provides main steam line radiation signals to Groups 1 and 2 via RPS.			
2. Provides GTS discharge to stack signal to Group 9.			4
I. TIP			
1. ISC causes automatic withdrawal, ball valve isolation and N_2 purge isolation to indexers.			4
J. RHS			
1. ISC cause RHS sample valves, drains to Radwaste and SDC valves to isolate.			
K. WCS			
1. Auto isolates upon command of ISC system.			
VI. DETAILED SYSTEM REFERENCE REVIEW	18		4
Review each of the referenced documents with the class.			
A. Technical Specifications			7
1. 3/4.3.2 Isolation Actuation			
2. 3/4.4.7 Main Steam Line Isolation Valves			
3. 3/4.6.3 Primary Containment Valves			4
B. Procedures		6	
1. N2-OP-83 Primary Containment Isolation System.			
VII. RELATED PLANT EVENTS			
Refer to Addendum "A" and review related events with class, (if applicable).			4

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.	
VIII. SYSTEM HISTORY				4
Refer to Addendum "B" and review related modifications with class, (if applicable).				
IX. WRAP-UP				
A. Review student learning objectives.				4