NRC Post Exam Comment Resolution
2017 Limerick NRC Initial License Exam

RO Question #5

Facility Request

Accept two correct answers (Key Answer C and also Choice B).

NRC Resolutions

Accept Choices B and C as correct answers.

Reasoning

The question asks applicants to select the choice that describes the bases for the power reduction directed in accordance with ON-119, "Loss of Instrument Air." Each of the two accepted choices describes one of the reasons for the power reduction. Therefore each is a correct answer to the question.

ON-119 Bases, "Loss of Instrument Air – Bases", Revision 28, explains, in part, that "reducing reactor power will *reduce feedwater flow rate and provide the feed pump control system greater margin to maintain adequate feed to the reactor should feed pump or condensate pump minimum flow valves start to drift open on low instrument operating air pressure*." This basis is described by Key Answer C, to "reduce the probability of inadequate feedwater should the condensate or feed pump min flow valves drift."

ON-119 Bases, "Loss of Instrument Air – Bases", Revision 28, explains, in part, that "*a reactor scram, should it occur, would be a less severe transient when initiated at a lower power level.*" The next ON-119 procedure step after the one directing a power reduction has the operator monitor for rod drift as low air pressure could cause rod drift and, if low pressure occurs, the operator is directed to manually scram the reactor. This basis is described by Choice B, to "reduce the transient if a SCRAM is required due to rods drifting in."

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Question #05

Given:

- INSTRUMENT AIR HEADER A PRESSURE LO annunciator is in alarm
- INSTRUMENT AIR HEADER B PRESSURE LO annunciator is in alarm
- Instrument Air header pressure is lowering

The CRS has directed a power reduction per ON-119, Loss Of Instrument Air

Which of the following describes the bases for the power reduction?

A. Reduce the probability of a turbine trip from lowering condenser vacuum.

B. Reduce the transient if a SCRAM is required due to rods drifting in.

C. Reduce the probability of inadequate feedwater should the condensate or feed pump min flow valves drift.

D. Reduce the probability of power exceeding 100% should the feedwater heater dump valves fail open.

Answer: C

Immediately following this Discussion is the Answer Explanation for Question #05 as it appeared on the RO portion of the Approved Exam Key.

Discussion

Of the ten (10) applicants, three (3) chose 'C', the correct answer, while the remaining seven (7) applicants chose distractor 'B'.

The procedure which the question is based upon, ON-119 Bases, "Loss of Instrument Air – Bases", provides direction to lower reactor power in response to degrading instrument air system pressure.

Question 05 centers on the basis for this power reduction.

The ON-119 Bases states the following for the power reduction step, 2.3.1:

" 2.3.1 **IF** pressure remains less than 85 psig,
THEN REDUCE reactor power to less than 44% in accordance with GP-5, Appendix 2, Section 3.1, Reducing Rx Power,
AND Reactor Maneuvering Shutdown Instructions.

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BASIS

Reducing reactor power will reduce feedwater flow rate and provide the feed pump control system greater margin to maintain adequate feed to the reactor should feed pump or condensate pump minimum flow valves start to drift open on low instrument operating air pressure. Also, a reactor scram, should it occur, would be a less severe transient when initiated at a lower reactor power."

This basis is the supporting information for choice 'C' being correct in that a power reduction is performed to reduce the probability of inadequate feedwater should the condensate or feedwater min flow valves fail open due to a loss of air to the valve operators.

The last sentence in this basis (re-stated below) supports choice 'B' also being correct.

"Also, a reactor scram, should it occur, would be a less severe transient when initiated at a lower reactor power."

The stem of the question identifies that the CRS has directed a power reduction per ON-119. From this information the applicants determine that both Instrument air headers remain less than 85 psig (ON-119 step 2.3.1) and procedural actions due to the transient need to continue to be executed. The subsequent steps in ON-119 (2.3.2 and 2.3.3) have the operator monitor for drifting control rods, and if control rod drifting is experienced to manually SCRAM the reactor, respectively.

"Should it occur" implies any scram whether manually or automatically initiated. Therefore, if a scram is manually initiated due to drifting control rods, as required by step 2.3.3, the resulting transient is less severe, due to the action to reduce power described in the stem of the question and discussed in the bases for step 2.3.1.

Therefore both Answers B and C are equally correct in that each answer provides a discreet part of the basis for how the impact to the plant is reduced with the action to reduce reactor power. Answers B and C each cover a portion of the basis for why a power reduction would be directed (as described in the stem of the question) but neither answer covers the entire bases nor does either answer form a subset of the other answer.

Distractors 'A' and 'D' remain incorrect. The question stem states the CRS has directed a power reduction per ON-119 then requests the basis for this power reduction, clearly asking the basis for the power reduction as described in ON-119. The basis for the power reduction makes no mention of an immediate need to address condenser vacuum or a feedwater heater transient. Therefore these two answers remain plausible but incorrect for the same reasons listed in the original answer explanation.

Applicant Comments:

Discussions with the applicants during post exam review revealed that their answers were based on their knowledge of what was contained in the basis for step 2.3.1. Additionally, one applicant provided a comment at time 1125 on 1/27/17 (during written exam administration) the he believed that both 'B' and 'C' are correct based on ON-119 Bases.

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Facility Recommendation

Based on the determination that the bases for ON-119 step 2.3.1 fully supports both choices 'B' and 'C' as equally correct, the facility agrees with the applicants and recommends that both Answers 'B' and 'C' be taken as correct answers to this question.

References:

1. ON-119, Loss of Instrument Air – Bases, Revision 28.

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5 **ID: 1454611** **Points: 1.00**

Answer Explanation
Both inst. air header low alarms coming in is an entry condition for ON-119. The bases for reducing power to 44% is to reduce the probability of a loss of adequate feedwater should the Condensate or RFP Min Flow valve begin to drift open. Low Instrument Air pressure could cause CRD HCU scram valves to drift open, resulting in the associated control rods to insert. This is the Bases for manually SCRAMING the reactor if control rods start to drift in Air ejector valves may fail due to loss of air causing vacuum to decrease, however ON-119 directs entry to OT-116 for loss of vacuum actions Feed water dump valves may fail open on a loss of air causing a power increase, however ON-119 directs operators to OT-104 for a loss of feedwater heating C is correct for the above reasons and the distractors are plausible to the examinee who does not recall the basis for reducing power to 44%

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Question 5 Info	
Question Type:	Multiple Choice
Status:	Active
Always select on test?	No
Authorized for practice?	No
Points:	1.00
Time to Complete:	3
Difficulty:	2.00
System ID:	1454611
User-Defined ID:	Q# 5 NEW
Lesson Plan Objective:	LGSOPS1550.03
Topic:	actions for loss of air
RO:	3.3
SRO:	3.4
KA#:	300000 K3.02

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Comments:	K3.02		
	General Data		
	Level	RO	
	Tier	2	
	Group	1	
	KA # and Rating	300000 K3.02 3.3/3.4	
	KA Statement	**Instrument Air System (IAS) Knowledge of the effect that a loss or malfunction of the . INSTRUMENT AIR SYSTEM) will have on the following:** Systems having pneumatic valves and controls	
	Cognitive level	Higher	
	Safety Function	8	
	10 CFR 55	41.7	
	Technical Reference with Revision No:	ON-119 P&ID M-0015 sht 4	**Rev #:** 28 40
	Justification for Non SRO CFR Link:	n/a	
	Question History: (i.e. LGS NRC-05, OYS CERT-04)	new	
	Question Source: (i.e. New, Bank, Modified)	new	
	Low KA Justification (if required):	N/A	
	Revision History: Revision History: (i.e. Modified distractor "b" to make plausible based on OTPS review)	new	
	ILT		
	Supplied Ref (If appropriate): (i.e. ABN-##)	none	
	LORT		
	PRA: (i.e. Yes or No or #)		
	LORT Question Section: (i.e, A-Systems or B-Procedures)		
	Comments		

EXELON GENERATION
LIMERICK GENERATING STATION

ON-119 LOSS OF INSTRUMENT AIR - BASES CM-1

1.0 SYMPTOMS

1.1 Both Instrument Air Header low pressure alarms.

BASIS
Both Instrument Air Header low pressure annunciators alarming (*18-B(C)-2) indicates that both the *A and *B Instrument Air Headers are less than the alarm setpoint of 85 psig. Air systems redundancy has failed to maintain at least one source of Instrument Air at normal pressure to critical plant valves and instrumentation. Consequently, plant stability is threatened.

1.2 Scram pilot air header low pressure alarm.

BASIS
This alarm (*08-D-5) is indicative of a low Instrument Air header pressure. Pressure is sensed downstream of a pressure control valve which reduces normal Instrument Air pressure to 70 to 75 psig. This alarm annunciates at 65 psig.

2.0 OPERATOR ACTIONS

2.1 **IF** any of the following compressors are **not** running,
THEN START them per S15.1.B:

- *A Instrument Air Compressor
- *B Instrument Air Compressor
- Service Air Compressor

BASIS
These compressors should be running and loaded (automatically) at receiver pressures less than 97 psig. A compressor not running may be a failure to auto start, and a manual start could restore Instrument Air pressure.

2.2 **MONITOR** the following instrument air pressure indications:

- PI-15-*20A, "*A Instrument Air Header Pressure" (PX), at *0C655
- PI-15-*20B, "*B Instrument Air Header Pressure" (PX), at *0C655

BASIS
Pressure indicators PI-15-*20A(B) indicate instrument air pressure downstream of the instrument air dryers and are indicative of actual pressure on the instrument air header.

- Computer point G500 (C*130), "*A Instrument Air Receiver Lower Pressure"
- Computer point G501 (C*131), "*B Instrument Air Receiver Low Pressure"

BASIS
G500 and G501 change from NORMAL to LO at 80 psig as measured at the instrument air receivers. These computer points can help determine if the loss of instrument air is resulting from a problem with the instrument air dryers or the instrument air compressor.

2.3 **IF** both PI-15-*20A, "Instrument Air Header Pressure Indicator" (PX),
AND PI-15-*20B "Instrument Air Header Pressure Indicator" (PX), at *0C655 are less than 85 psig,
THEN PERFORM the following:

2.3.1 **IF** pressure remains less than 85 psig,
THEN REDUCE reactor power to less than 44% in accordance with GP-5, Appendix 2, Section 3.1, Reducing Rx Power,
AND Reactor Maneuvering Shutdown Instructions.

BASIS
Reducing reactor power will reduce feedwater flow rate and provide the feed pump control system greater margin to maintain adequate feed to the reactor should feed pump or condensate pump minimum flow valves start to drift open on low instrument operating air pressure. Also, a reactor scram, should it occur, would be a less severe transient when initiated at a lower reactor power.

2.3.2 **MONITOR** control rod positions for inadvertent inward drifting via Control Rod Position Report
AND ROD DRIFT (*08-F-4) alarm.

2.3.3 **IF** control rods drift,
THEN manually **SCRAM** the reactor
AND PLACE Mode Switch in "SHUTDOWN"
AND ENTER T-100, SCRAM
OR T-101, as applicable..

BASIS
Low Instrument Air pressure could cause CRD HCU scram valves to drift open, resulting in the associated control rods to insert. Operation at power with an abnormal rod pattern could result in a highly undesirable core power distribution.

2.3.4 **REVIEW** GP-5 Appendix 2, Section 3.1, Reducing Rx Power,
AND ENSURE all required actions are performed for power reductions.

BASIS

Self explanatory

2.3.5 **MONITOR** reactor water level
AND reactor feedwater flow for possible loss of feedwater due to condensate/RFPT min. flow valves failing open.

BASIS
The condensate pump minimum flow valve and the reactor feed pump minimum flow valves fail open on a loss of operating air. Should any of these valves drift open while at high power, a loss of feed in excess of feed system reserve capacity could result.

2.3.6 **IF** reactor water level drops,
THEN ENTER OT-100
AND EXECUTE concurrently.

BASIS
OT-100, Reactor Low Level, gives the immediate operator actions for low reactor water level.

2.3.7 **MONITOR** feedwater string operation for loss of feedwater heating.

BASIS
The dump valves associated with the feedwater heaters fail open on a loss of operating air. Should any of these valves drift open, feedwater heating would be reduced, and increased feed subcooling could elevate core thermal power above the 100% load line.

2.3.8 **IF** feedwater heating is lost
OR partially lost,
THEN ENTER OT-104
AND EXECUTE concurrently.

BASIS
OT-104, Unexpected/Unexplained Reactivity Insertion, gives the immediate operator actions for a reactivity insertion resulting from a loss of feedwater heating.

2.3.9 **MONITOR** condenser vacuum for possible loss of vacuum.

BASIS
The steam jet air ejector steam supply pressure control valves and air ejector discharge (recirc to the condenser) pressure control valves fail open on a loss of operating air. The level control valves associated with the offgas preheater, after condenser, and hold-up pipe drains fail closed. Should any of these valves drift to their failed position, condenser vacuum could be adversely affected.

2.3.10 **IF** condenser vacuum drops,
THEN ENTER OT-116
AND EXECUTE concurrently.

BASIS
OT-116, Loss of Condenser Vacuum, gives the immediate operator actions for loss of condenser vacuum.

WARNING

With Service Air header isolated from the Service Air compressor, Backup Service Air must be available to the affected Unit to ensure a continued supply of breathing air **AND** to refuel floor seals.

2.4 **ENSURE** Backup Service Air is in service
AND can supply the affected Unit Service Air header.

BASIS
Service Air header will be isolated from the Service Air compressor on a low Instrument Air condition. Backup Service Air should be in service and selected to the appropriate Unit so that air will be supplied to users such as breathing air and fuel pool inflatable seals.

2.5 **DISPATCH** operator to:

2.5.1 **VERIFY** TECW cooling water available to compressors which will **not** start **AND** remain loaded.

BASIS
A loss of compressor cooling is the most likely source of compressor trouble.

2.5.2 **MONITOR** *A(B)-C130 Instrument Air Dryer prefilter **AND** after filter differential pressures at *0C130A(B).

2.5.3 **IF** *A(B) Instrument Air Dryer prefilter
OR after filter differential pressures are greater than 5 psid,
THEN PLACE appropriate standby filter in service per S15.6.E

BASIS
Clogged air dryer filters could be at fault. Valving into service the standby filters takes relatively little time.

NOTE

1. The Instrument Air Dryer control power switch is located on the bottom right hand side of *A(B)-C130 INSTRUMENT AIR DRYER CONTROL PANEL. The ON position for the switch is IN (toward the panel) and the OFF position is OUT (away from the panel.) [ ]

2. Turning off control power to the Instrument Air Dryer will cause both tower inlet valves to electrically fail open **AND** the exhaust and re-pressurization valves to electrically fail closed. This allows a continuous flow of air through both dryer towers to the associated instrument air header. [ ]

3. Operating with both dryer towers in service **AND no** regeneration cycle for prolonged periods of time will result in decreased dryer performance and higher dew points. [ ]

4. Do **not** allow the Instrument Air Dryer to be operated at a dew point higher than -10 degrees F, **OR** with desiccant indicator having a pink color. [ ]

2.5.4 **IF** *A(B) Instrument Air Dryer has continuous exhaust flow for more than 3 minutes
OR there is no flow through either dryer tower as indicated on FI-015-*40A/C

THEN PLACE Instrument Air Dryer control power switch in the OFF position (away from the panel).

BASIS
Turning dryer off will stop continuous blowdown and end pressure decrease.

2.5.5 **CLOSE** 15-*042, "Service Air Comp Air Receiver Outlet" (328-T1-217/357-T5-217).

BASIS
Both Instrument Air receivers less than 70 psig should cause the automatic Service Air header isolation valve to close, dedicating the output of the Service Air compressor to the Instrument Air system. Should a fault exist downstream of the automatic isolation valve and that valve not fully close, Service Air system capacity as a backup source of air could be degraded.

NOTE

1. Following step assumes Service Air was backing up "A" Instrument Air Header at time of pressure loss.

2. **IF** Service Air was backing up "B" Instrument Air header,
THEN 15-*009A, "Service Air To "A" Inst Air Tie Vlv," would be closed
AND 15-*009B, "Service Air To "B" Inst Air Tie Vlv," would be opened.

2.5.6 **IF** Service Air compressor is still operating
AND Instrument Air pressure is **not** increasing,
THEN PERFORM the following:

1. **CLOSE** 15-*009A(B), "Service Air To A(B) Inst Air Tie Vlv" (328-T1-217/357-T5-217).

2. **OPEN** 15-*009B(A), "Service Air To B(A) Inst Air Tie Vlv", in an attempt to repressurize the header (328-T1-217/357-T5-217).

BASIS
In the case of a failure of B(A) Instrument Air compressor and a coincident failure of A(B) Instrument Air header (i.e. line break), it would be appropriate to isolate Service Air to the A(B) header and to valve it into the B(A) header.

2.5.7 **IF** Service Air compressor discharge pressure is greater than Instrument Air compressor discharge pressures,
THEN OPEN 15-*027, "Service Air to Inst Air Tie Vlv" (328-T1-217/357-T5-217).

BASIS
Service air pressure should not be significantly greater than Instrument Air header pressure since the Service/Instrument Air header cross-tie check valve augments Service Air to the Instrument Air header. However, if the cross-tie check valve was to malfunction (not open), Service Air pressure could be greater than Instrument Air pressure. Only in this situation should the cross-tie check valve be bypassed to restore the backup air supply to Instrument Air.

CAUTION

1. Jeopardizing an operating Unit by supplying Instrument Air to the other Unit should be avoided.

2. **IF** the Instrument Air problem has been identified
AND the operating Unit will **not** be adversely affected by cross connection,
THEN the following step should be used.

2.5.8 **IF** Instrument Air pressure has **not** been re-established
AND the other Unit's Instrument Air system is available,
THEN CROSS CONNECT Instrument Air between Units 1 and 2 as follows:

1. **MONITOR** operating Unit Instrument Air system during cross connection efforts.

2. **ENSURE** OPEN 15-0563A, "A Inst Air Hdr To & From Unit #2 Turbine Area Stop Valve" (277-T9*200) located just south-east of 2B RFP Lube Oil Reservoir,
AND 15-0563B, "B Inst Air Hdr To & From Unit #2 Turbine Area Stop Valve" (277-T9*200) located south of room 276A against wall 8 ft up.

3. Slowly **OPEN** 15-0100A, "Unit 1 To Unit 2 Inst Air A Hdr Tie Valve" (258-A8-200) located just north of the A MCR Chiller,
AND 15-0100B, "Unit 1 To Unit 2 Inst Air B Hdr Tie Valve" (263-A8-200) located about 10 ft east of the B MCR Chiller.

4. **IF** operating Unit Instrument Air system performance is degraded,
THEN TERMINATE cross connection efforts.

BASIS
If all previous efforts to restore Instrument Air have failed, cross connection between the two Units may be considered. The possible adverse consequences to the non-affected Unit need to be carefully considered prior to cross connecting air systems. An operating Unit could be inadvertently tripped or otherwise unfavorably affected. The malfunction in the affected Unit air system must be identified and understood prior to considering this corrective action. Slowly opening cross connection valves while monitoring the non-affected Unit air system performance should allow termination of the evolution if significant pressure losses or other non-desirable events occur.

2.6 **IF** pressure can **not** be restored to either Instrument Air header,
THEN COMMENCE rapid plant shutdown per GP-4.

BASIS
The plant cannot operate indefinitely without proper pressure present in at least one of the two Instrument Air headers. Should the determination be made that Instrument Air cannot be restored, the plant should be shutdown in a controlled fashion before Instrument Air loss degrades plant systems in a random unpredictable manner.

2.6.1 **WHEN** all control rods are inserted per GP-4
THEN TRIP *A
AND *B ASD Systems via pushbutton PB-043-*02A, "*A ASD Normal Stop"
AND PB-043-*02B, "*B ASD Normal Stop"

BASIS
The drywell chilled water system shuts down, and the reactor recirculation pump mechanical seal purge supply isolation valves fail closed on a loss of Instrument Air. The reactor recirc pumps are not needed when the reactor is shut down and should not be operated without seal purge and motor airspace cooling.

NOTE

MSIVs may begin to drift closed.

2.6.2 **IF** Main Condenser can **not** be maintained as a heat sink, **THEN PERFORM** the following:

1. **CLOSE** inboard **AND** outboard MSIVs.

2. **ENSURE** HV-41-*F016, "Main Stm Line Drain Inboard PCIV" (STEAM DRAINS INBOARD), **AND** HV-41-*F019, "Main Stm Line Drain Outboard PCIV" (STEAM DRAINS OUTBOARD), closed at *0C601.

3. **ENTER** T-101 for reactor vessel pressure **AND** level control.

BASIS
The main condenser is not a maintainable heat sink without Instrument Air. The auxiliary boilers become inoperable, the offgas system drain valves fail closed, and the mechanical vacuum pump suction isolation valve fails closed on a loss of Instrument Air. Isolating reactor pressure vessel steam protects the main turbine, condenser and associated auxiliary systems by forcing decay heat to be deposited in the suppression pool where the energy can be dissipated by systems not dependent upon Instrument Air.

NOTE

Placing RECW in service to cool the Drywell will violate primary containment integrity.

2.6.3 **SECURE** Drywell Chilled Water per S87.2.A **AND CONSIDER** placing RECW in service to cool the Drywell per S13.6.D.

BASIS
The Drywell Chilled Water System will shut itself down on a loss of Instrument Air and so should be secured in a controlled fashion. RECW backup to DWCW may be able to be placed in service, however, primary containment will be violated. (Ref. 3.3.2)

2.6.4 **MONITOR** secondary containment pressure.

2.6.5 **IF** Reactor Enclosure HVAC isolates,
THEN PERFORM the following:

1. **ENSURE** SGTS maintains secondary containment pressure at least negative 0.25 inches of water pressure.

2. **IF** secondary containment pressure can **not** be maintained
THEN ENTER ON-111
AND EXECUTE concurrently.

BASIS
Reactor building ventilation supply and exhaust dampers fail closed on a loss of Instrument Air, tripping their respective fans. The recirculation and standby gas treatment systems should still function to maintain proper negative secondary containment pressure. The operator should monitor secondary containment pressure to ensure pressure is controlled within Technical Specifications requirements. ON-111, Loss Of Secondary Containment, provides the operator actions in the event secondary containment pressure can not be maintained.

2.6.6 **MONITOR** following levels
AND TAKE manual action, as necessary, to control level.

- RECW Head Tank

- TECW Head Tank

BASIS
The automatic makeup valves for these tanks fail closed on a loss of Instrument Air.

- Main Condenser Hotwell

BASIS
The coarse and fine condensate makeup and reject valves all fail closed on a loss of Instrument Air.

- Condensate Storage Tank

BASIS
The Condensate Storage Tank (CST) makeup isolation valve fails closed. Additionally with the condensate makeup and reject valves failing closed, if a condensate pump is in service, CST level could actually rise if a reject valve leaks by.

2.6.7 **MINIMIZE** evolutions that discharge water to Radwaste.

BASIS
The radwaste processing systems are inoperable without Instrument Air. Any water collected by the drain collection systems will accumulate in the Floor Drain Collection Tank, the Equipment Drain Collection Tank, and the Chemical Waste Tank. Unnecessary depletion of the available storage capacity of these tanks is undesirable.

UNIT 2 ONLY

2.6.8 **IF** the loss of instrument air occurred on Unit 2
THEN SECURE Auxiliary Boilers per S21.2.A.

BASIS
The Auxiliary Boilers will shut themselves down on a loss of Instrument Air and so should be secured in a controlled fashion. Instrument air is supplied to the auxiliary boilers from the 2A and 2B Instrument air compressors. Thus, the auxiliary boilers only need to be secured if pressure cannot be restored to the 2A or 2B instrument air header.

2.6.9 **MONITOR** Reactor Pressure.

2.6.10 **IF** Reactor begins to depressurize due to the SSE main steam supply valve PV-C-07-*53, "Stm Seal Evap Main Stm." failing open
THEN CLOSE HV-07-*50, "Main Stm to SSE Inlet Vlv. (Stm Sup)".

BASIS
The Steam Seal Evaporator main steam supply valve PV-C-07-*53 fails open on a loss of air. The Reactor may depressurize through the SSE and through the main steam supply pressure relief valves PSV-07-*51A(B)(C)(D)(E)(F). Closing
HV-07-*50 will isolate main steam from the SSE and prevent Reactor Depressurization.

2.7 **ENSURE** IR created for engineering to evaluate the need for instrument air quality testing.

BASIS
Self-Explanatory

3.0 REFERENCES

3.1 TECHNICAL SPECIFICATIONS

NONE

3.2 INTERFACING PROCEDURES

3.2.1 GP-4, Rapid Plant Shutdown To Hot Shutdown

3.2.2 GP-5 Appendix 2, Planned Rx Maneuvering Without Shutdown

3.2.3 ON-111, Loss Of Secondary Containment

3.2.4 OT-100, Reactor Low Level

3.2.5 OT-104, Unexpected/Unexplained Reactivity Insertion

3.2.6 OT-116, Loss of Condenser Vacuum

3.2.7 S13.6.D, RECW Operation With Loss of Drywell Chilled Water

3.2.8 S15.6.E, Placing Standby Instrument Air Dryer Prefilter/Afterfilter In Service

3.2.9 S21.2.A, Shutdown of an Auxiliary Boiler

3.2.10 S87.2.A, Normal Shutdown Of The Drywell Chilled Water System

3.2.11 T-100, SCRAM/SCRAM Recovery

3.2.12 T-101, RPV Control

3.3 OTHER

3.3.1 **CM-1** SOER 88-01, Rec. #1, T01785

3.3.2 NCR 94-00254

NRC Post Exam Comment Resolution
2017 Limerick NRC Initial License Exam

SRO Question #92

Facility Request

Accept two correct answers (Key Answer D and also Choice B).

NRC Resolutions

Delete the question from the exam.

Reasoning

Applicants are asked in the first part of this two-part question to select a T-225 action (either "spray the drywell" or "spray the suppression pool"). Then, in the second part of the question they are asked whether the chosen "action" requires field manual operations completed outside the main control room. An argument can be made for a "no" response in the second part of the question (Answer Choice B) because suppression pool spray can be initiated without the field action to initiate cooling of the spray water. An equally valid argument can be made for a "yes" response in the second part of the question (Key Answer Choice D) because the system alignment per the T-225 procedure does establish cooling of the spray water, which requires field manual operations completed outside the main control room.

Per the guidance in NUREG-1021, ES-403, Section D.1.c, the question will be deleted from the exam because it has two correct answers that contradict each other. Choice B states that no local manual operation is required, whereas Choice D states that local manual operation is required.

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Question #92

SRO

Unit 1 is operating at 100% power when a LOCA occurs
Plant conditions are as follows;

- Drywell pressure is 14 psig
- Drywell temperature is 248 degrees
- Reactor level is -140 inches up slow with HPCI

Suppression pool level is 42 feet

D12 bus lockout occurs

D13 load center breaker trips and cannot be reclosed

Which of the following describes (1) the T-225 action to be taken by the CRS and (2) whether local manual operation, outside the MCR, of RHRSW Heat Exchanger Inlet and/or Outlet Valve(s) is required to complete the action?

A. (1) Spray the Drywell
(2) No

B. (1) Spray the Suppression Pool
(2) No

C. (1) Spray the Drywell
(2) Yes

D. (1) Spray the Suppression Pool
(2) Yes

Answer: D

Immediately following this Discussion is the Answer Explanation for Question #92 as it appeared on the SRO portion of the Approved Exam Key.

Discussion

Question 92 Part 1

Part 1 of the question tests the SRO applicants knowledge of the impact of high Suppression Pool water level on the T-225 Containment Spray strategy directed from Procedure T-102. Use of the stem information is required for the SRO applicant to successfully select the correct procedural action for the emergency situation. Suppression Pool level of 42 feet is given in the stem.

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The assessment into whether spraying the Suppression Pool is permitted is assessed by the SRO applicants in T-102 step PC/P-7. Spraying of the Suppression Pool is permitted provided Suppression Pool level is below 48 feet.

The assessment into whether spraying the Drywell is permitted is assessed by the SRO applicants in T-102 step PC/P-10. Spraying of the Drywell is not permitted if Suppression Pool level is greater than 37.4 feet.

For the above reasons, the SRO applicants' assessment of the facility conditions results in the selection of T-225 section 4.2, Initiating Suppression Pool Spray using RHR. The correct answer to part 1 is, "Spray the Suppression Pool".

Question 92 Part 2

Part 2 of Question 92 was developed with the intent to determine whether or not the applicant understood the impact of the power losses, described in the stem, on the Unit 1 RHR components and their functions in completing all of the steps directed by T-225 Section 4.2, Initiating Suppression Pool spray using RHR. To complete this section of the procedure the applicant was expected to understand that following establishment of the required RHR system flow path and flow rate, T-225 section 4.2 concludes with directing the performance of S12.1.A, RHR Service Water System Startup.

Based on the stem condition which states that the D13 load center breaker trips and cannot be reclosed all electrical loads downstream of this breaker will be without power. The 1A RHR Heat Exchanger RHRSW Outlet Valve (HV-051-1F068A), a normally closed valve, is powered from D134-R-H-19. D134-R-H-19 is a downstream load off of the D13 load center and therefore the motor operator to HV-051-1F068A has no power.

T-225, Startup and Shutdown of Suppression Pool and Drywell Spray Operation Revision 22 section 4.2, Initiating Suppression Pool Spray Using RHR, has the operator establish a spray flowpath of RHR taking a suction from the Suppression Pool and returning it to the suppression pool via the Full Flow Test Return Valve (HV-51-1F024A) and the RHR Suppression Pool Spray Line PCIV (HV-51-1F027A(B)). Once this flow path is established, the operator is directed to monitor Suppression Pool Pressure, and Suppression Pool Air Space Temperature. At this point in the procedure Suppression Pool spray has been established as confirmed by the operator action to verify the response of Suppression Pool Pressure and Air Space Temperature.

Once the RHR system is in service and spraying the suppression pool, T-225 directs starting the RHR Service Water Pump for the in-service RHR Heat Exchanger per S12.1.A. With the electrical conditions stated previously, Step 4.1.5.2 of S12.1.A directs the operator to manually open HV-51-1F068A approximately 150 turns. This valve is located in the Unit 1 Reactor Enclosure Elevation 201' in the 1A and 1C RHR room. Operation of this valve under those conditions is a local manual operation and is required to complete both S12.1.A and Section 4.2 of T-225. Therefore based on the original intent of the question choice 'D' is correct.

However, associating the action in part 1 (spraying the Suppression Pool) with the requirements to line up RHRSW per S12.1.A in part 2 was not clearly established.

Based on the construction of T-225 Section 4.2 which clearly established monitoring of the impact of Suppression Pool Sprays after establishing the RHR system in service, and before placing RHRSW in service, the applicants correctly applied T-225 steps and determined that the RHR system could achieve the required flow path and flow rate required for Suppression Pool Spray without the need for RHRSW as a supporting system. Therefore local-manual operation of RHRSW Heat Exchanger Inlet and/or Outlet Valve(s) was determined to not be required and Choice B also becomes a correct answer.

Due to the question stem not delineating between the required actions to physically establish suppression pool spray and the completion of the entire section of T-225 for Suppression Pool Spray, the question was able to be interpreted in two ways as described above. These two interpretations resulted in both answers B and D being equally correct.

Applicant Comments:

Discussions with the applicants during post exam review revealed that the three (3) applicants that selected "No" for part 2 interpreted part 2 of the question to be asking, "Is local-manual operation of RHRSW Heat Exchanger Inlet and or Outlet valves required to establish an RHR system flow path that generates the required RHR flow rate for spray of the Suppression Pool?" Given this interpretation, the applicants correctly applied T-225 steps and determined that the RHR system could achieve the required flow path and flow rate required for Suppression Pool Spray without the need for RHRSW system operation or the use of local-manual operation of RHRSW Heat Exchanger Inlet and/or Outlet Valve(s).

Facility Recommendation

Due to the question stem not delineating between the required actions to physically establish suppression pool spray and the completion of the entire section of T-225 for Suppression Pool Spray and placing RHRSW in service, the question was interpreted in two ways as described above. These two interpretations resulted in both answers B and D being equally correct. The facility agrees with applicants and as a result recommends that both choices 'B' and 'D' be taken as a correct answer to question 92.

References:

1. T-102, Primary Containment Control, Rev 25
2. T-225, Startup and Shutdown of Suppression Pool and Drywell Spray Operation, Rev 22
3. S12.1.A, RHR Service Water System Startup, Rev 53

92 **ID: 1454490** **Points: 1.00**

Answer Explanation

A Incorrect plausible to examinee who does not diagnose >37.4 feet suppression pool level, and that drywell spray is prohibited per PC/P-10 of T-102. plausible to the examinee who does not recall that Div 3 power supplies the A RHR htx outlet valve.

B Incorrect plausible to the examinee who does not recall that Div 3 power supplies the A RHR htx outlet valve.

C Incorrect plausible to examinee who does not diagnose >37.4 feet suppression pool level, and that drywell spray is prohibited per PC/P-10 of T-102.

D Correct examinee recognizes safe to spray but realizes suppression pool level is too high to spray the Drywell and directs pool spray. With a loss of D13 load center the A RHRSW outlet valve to the RHR HTX has no power and must be opened manually. S12.1.A which is directed from T-225 includes direction for manual operation of RHRSW valves if required.

2017 Limerick ILT NRC Exam Post-Exam Challenges

Question 92 Info	
Question Type:	Multiple Choice
Status:	Active
Always select on test?	No
Authorized for practice?	No
Points:	1.00
Time to Complete:	3
Difficulty:	3.00
System ID:	1454490
User-Defined ID:	Q# 92 NEW
Lesson Plan Objective:	LGSOPS1560.06
Topic:	SRO FLR action cont. SPRAY
RO:	3.8
SRO:	4.0
KA#:	226001 2.4.35

2017 Limerick ILT NRC Exam Post-Exam Challenges

Comments:

General Data			
Level	SRO		
Tier	2		
Group	2		
KA # and Rating	226001 2.4.35 3.8/4.0		
KA Statement	RHR/LPCI: Containment Spray System Mode **Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.**		
Cognitive level	Higher		
Safety Function	5		
10 CFR 55	43.5		
Technical Reference with Revision No:	E11-1040 sht 15	**Rev #:**	1
Justification for Non SRO CFR Link:	n/a		
Question History: (i.e. LGS NRC-05, OYS CERT-04)	new		
Question Source: (i.e. New, Bank, Modified)	new		
Low KA Justification (if required):	n/a		
Revision History: Revision History: (i.e. Modified distractor "b" to make plausible based on OTPS review)	new		
ILT			
Supplied Ref (If appropriate): (i.e. ABN-##)			
LORT			
PRA: (i.e. Yes or No or #)			
LORT Question Section: (i.e, A-Systems or B-Procedures)			
Comments			

*** * UNIT 1 ONLY * ***

EXELON NUCLEAR
LIMERICK GENERATING STATION

T-225 STARTUP AND SHUTDOWN OF SUPPRESSION POOL AND DRYWELL SPRAY OPERATION

1.0 PURPOSE

1.1 To Spray Suppression Pool/Drywell air space using RHR.

1.2 To bypass interlocks of Containment Spray Isolation valves, in preparation for initiating Containment Spray using only one loop of RHR.

1.3 To Spray Drywell/Suppression Pool Air Space using RHR Service Water Loop 'B'

1.4 To Spray Drywell/Suppression Pool air space using Fire System.

2.0 REFERENCES

2.1 T-102, Primary Containment Control

2.2 SAMP-1, Sheets 2 through 7, RPV and Primary Containment Flooding Control

2.3 M-1-E-11-1040, RHR Elementary Diagram

2.4 M-51, P&ID - RHR System

2.5 A41-8010-K5 - ECCS Operation and Maintenance Instruction

2.6 L.B. Pyrih letter to M.J. McCormick, dated June 27, 1990, LGS Diesel Generator Loading Limitations.

2.7 RT-6-100-904-1, Routine Inspection of OSC T-200 Series Locker

* * UNIT 1 ONLY * *

2.8 RT-6-100-905-1, Routine Inspection of T-200 Series Hose Locker

2.9 RT-6-100-906-1, T-200 Procedure Tag And Banana-Jack Accountability

2.10 S12.1.A, RHR Service Water System Startup

2.11 S12.2.A, Shutdown Of RHR Service Water Pumps And System

2.12 S58.1.B, Startup Of Containment Hydrogen Recombiner From Standby Condition Or Following A Trip

2.13 S43.2.A, Shutdown Of A Recirculation Pump

2.14 SE-10, LOCA

2.15 S51.1.A, Set Up Of RHR System For Automatic Operation On LPCI Mode

2.16 ECR 96-00899, HV-51-1F027B Overtorque

2.17 ECR 96-00219, HV-51-1F016A Overtorque

3.0 PREREQUISITES

3.1 TRIP
OR SAMP procedures must direct the use of this procedure.

3.2 RHR System aligned per S51.1.A, Set Up Of RHR System For Automatic Operation in LPCI Mode.

* * UNIT 1 ONLY * *

NOTE

Step 3.3 is only required for the following conditions:

- **NO** LOCA signal present

AND

- Initiation pushbuttons in the Main Control Room fail to operate

3.3 The following tools/equipment obtained from Unit 1 T-200 Cabinet in OSC, BL-840 key required.

- (1) Slotted Screwdriver
- (1) Screwholding Screwdriver
- (4) Electrical Jumpers
- (1) Flashlight
- (1) LV-100 key

NOTE

Step **3.4** required only for section **4.4**
OR 4.7 (Initiating Suppression Pool Spray Using Fire Protection System Crosstie
OR Initiating Drywell Spray Using Fire Protection System Crosstie).

3.4 Necessary tools/equipment obtained from Unit 1 T-225/T-244 Hose Storage Locker (402-R16-253) BL-840 key required (ATTACHMENT 5).

* * UNIT 1 ONLY * *

4.0 PROCEDURE

NOTE

Conditional **IF**...**THEN** steps that are **not** applicable
AND steps to be skipped per direction of the **IF**...**THEN** step shall be marked N/A
AND initialed.

CAUTION

1. Use of two loops of Drywell Spray can result in Containment Damage due to excessive negative pressure.

2. **IF** the EDG is carrying the respective Bus,
THEN the EDG load must be below 1000 kw prior to starting an RHR Pump, to prevent loss of the other EDG loads.

   Consider removing the following loads as required to obtain less than 1000 kw on the respective Bus:

   - Core Spray Pump 529 kW
   - RHRSW Pump 519 kW
   - ESW Pump 389 kW
   - MCR Chiller 309 kW

4.1 LINEUP SUPPRESSION POOL OR DRYWELL SPRAY

4.1.1 **SPRAY** Suppression Pool as directed by T-102
OR SAMP-1 as follows:

- **IF** spraying Suppression Pool using RHR
THEN GO TO Section **4.2** _____
- **IF** spraying Suppression Pool using RHR Service Water
THEN GO TO Section **4.3** _____
- **IF** spraying Suppression Pool using Fire System Crosstie
THEN GO TO Section **4.4** _____

* * UNIT 1 ONLY * *

4.1.2 **SPRAY** Drywell as directed by T-102 **OR** SAMP-1 as follows:

- **IF** spraying drywell using RHR **THEN GO TO** Section **4.5** _____
- **IF** spraying drywell using RHR Service Water **THEN GO TO** Section **4.6** _____
- **IF** spraying drywell using Fire System Crosstie **THEN GO TO** Section **4.7** _____

4.2 **INITIATING SUPPRESSION POOL SPRAY USING RHR**

4.2.1 **ENSURE** HV-51-1F004A(B), "1A(B) RHR Pump Suction PCIV," (SUCTION A(B)) open. _____

4.2.2 **ENSURE** the following valves closed:

- HV-51-1F006A(B), "1A(B) RHR Pp S/D Clg Suct Intertie Vlv" (SUCTION A(B)) _____
- HV-51-1F015A(B), "1A(B) Shutdown Clg Injection PCIV" (OUTBOARD) _____
- HV-51-1F016A(B), "1A(B) RHR Cntmt Spray Line Outboard PCIV" (OUTBOARD) _____
- HV-51-1F017A(B), "1A(B) RHR LPCI Inj PCIV" (OUTBOARD A(B)) _____

4.2.3 **IF** RHR pump **not** running **THEN** start 1A(B)P202 "RHR Pump" _____

4.2.4 **ENSURE** the following valves open:

- HV-51-1F047A(B), "1A(B) RHR Htx Shell Side Inlet Vlv" (INLET) _____
- HV-51-1F003A(B), "1A(B) RHR Htx Shell Side Outlet Vlv" (OUTLET) _____
- HV-C-51-1F048A(B), "1A(B) RHR Htx Shell Side Bypass Vlv" (HEAT EXCH BYPASS) _____

* * UNIT 1 ONLY * *

4.2.5 **OPEN** HV-51-1F024A(B), "1A(B) RHR Pp Full Flow Test Return Vlv" (SUPP POOL CLG A(B) **AND OBTAIN** flow of 8,000 to 8,500 gpm as indicated on FI-51-1R603A(B), FL. _____

4.2.6 **OPEN** HV-51-1F027A(B), "1A(B) RHR Supp Pool Spray Line PCIV" (SUPP POOL SPRAY). _____

4.2.7 **MONITOR** the following:

- PR-57-101. "Suppression Pool Pressure" (PX) _____
- TR-57-110. "Suppression Pool Air Space Temperature" (TP) **AND** TR-57-122, "Drywell Temperature" (TP) _____
- FI-51-1R603A(B), "RHR System Flow" (FL) **AND** TI-51-127A(B), "RHR Htx Outlet" (TP) _____

4.2.8 **PLACE** RHR Service Water Pump for RHR Heat Exchanger to be used in service per S12.1.A, RHR Service Water System Startup. _____

NOTE

RHR Heat Exchanger Shell Side Bypass Valve opens automatically on LOCA initiation **AND** receives an open signal for three minutes following LOCA initiation.

4.2.9 **CLOSE** HV-C-51-1F048A(B), "1A(B) RHR Htx Shell Side Bypass Vlv" (HEAT EXCH BYPASS). _____

CAUTION

Maintaining greater than 1,500 gpm flow will prevent pump damage.

4.2.10 **IF** more spray flow is required, **THEN REDUCE** flow through Full Flow Test line by throttling closed HV-51-1F024A(B), "1A(B) RHR Pp Full Flow Test Return Vlv" (SUPP POOL CLG A(B)). _____

* * UNIT 1 ONLY * *

4.2.11 **WHEN** shutdown of Suppression Pool Spray using RHR is required,
THEN PERFORM section **4.8**. _____

4.3 INITIATING SUPPRESSION POOL SPRAY USING RHR SERVICE WATER

4.3.1 **ENSURE** 1BP202, "RHR Pump" **not** running. _____

4.3.2 **ENSURE** the following valves closed:

- HV-51-1F004B, "1B RHR Pump Suction PCIV" (SUCTION B) _____
- HV-51-1F006B, "1B RHR Pp S/D Clg Suct Vlv" (SUCTION B) _____
- HV-51-1F015B, "1B Shutdown Clg Injection PCIV" (OUTBOARD) _____
- HV-51-1F016B, "1B RHR Cntmt Spray Line Outboard PCIV" (OUTBOARD) _____
- HV-51-1F017B, "1B RHR LPCI Inj PCIV" (OUTBOARD B) _____
- HV-51-1F024B, "1B RHR Pp Full Flow Test Return Vlv" (SUPP POOL CLG B) _____
- HV-51-1F027B, "1B RHR Supp Pool Spray Line PCIV" (SUPP POOL SPRAY) _____
- HV-51-1F047B, "1B RHR Htx Shell Side Inlet Vlv" (INLET) _____
- HV-C-51-1F048B, "1B RHR Htx Shell Side Bypass Vlv" (HEAT EXCH BYPASS) _____
- 051-1F098, "Cond Trans Fill Isol Vlv to 1A & 1B RHR Loops" (402-R11-253) (ATTACHMENT 6) _____

* * UNIT 1 ONLY * *

4.3.3 **PLACE** the following handswitch in "BYPASS" at 00C667 (Main Control Room) to prevent an inadvertent trip:

- HSS-012-002B, "B/D RHRSW Pump RHR Htx High Rad Trip Keylock Bypass B/D" (B/D) _____

4.3.4 **PLACE** RHR Service Water Loop B in service using B
OR D RHR Service Water pump per S12.1.A, RHR Service Water System Startup. _____

CAUTION

IF a LOCA signal is present
AND differential pressure across HV-51-1F017B, "1B RHR LPCI Inj PCIV," (OUTBOARD B) drops below 74 psid,
THEN injection valve will automatically open
AND RHR Service Water will add inventory to the vessel.

4.3.5 **OPEN** the following RHR Service Water/RHR Emergency Crosstie Valves at 10C601 (Main Control Room):

- HV-51-1F073, "RHR Service Water Crosstie" (CROSSTIE) _____

- HV-51-1F075, "RHR Service Water Crosstie" (CROSSTIE) _____

* * UNIT 1 ONLY * *

NOTE

Step 4.3.6 will require coordination between an Operator at 00C667 **AND** a second Operator at 10C601.

4.3.6 Simultaneously **PERFORM** the following to maintain RHR Service Water discharge pressure 75 to 120 psig as indicated on PI-12-001B-1, "Pump B/D Disch" (Px), at 00C667 (Main Control Room):

- Throttle **CLOSED** HV-51-1F068B, "1B RHR Htx SW Outlet Vlv" (1B) at 00C667 (Main Control Room). _____
- Throttle **OPEN** HV-51-1F027B, "1B RHR Supp Pool Spray Line PCIV" (SUPP POOL SPRAY) at 10C601 (Main Control Room) to spray suppression pool. _____

4.3.7 **WHEN** shutdown of Suppression Pool Spray using RHR Service Water is required, **THEN PERFORM** section **4.9**. _____

* * UNIT 1 ONLY * *

4.4 INITIATING SUPPRESSION POOL SPRAY USING FIRE PROTECTION SYSTEM CROSSTIE

4.4.1 **PERFORM** the following in 402-R16-253 (ATTACHMENT 5):

1. **CONNECT** hose at 51-1179 "1B RHR Fire Protection Crosstie Connection Drain Valve"
AND ROUTE to drain
THEN CYCLE 51-1179 open
AND closed to ensure piping vented. _____

2. **CONNECT** hose at 22-1430, "Fire Protection/RHR Interconnection Drain Vlv"
AND ROUTE to drain
THEN CYCLE 22-1430 open
AND closed to ensure piping vented. _____

3. **CONNECT** hose to fitting downstream of 22-1429, "Fire Protection/RHR Interconnection Isolation Vlv." _____

4. **CONNECT** other end of hose to 51-1178, "1B RHR Fire Protection Crosstie Connection Isolation Valve." _____

5. **OPEN** 22-1429. _____

6. **OPEN** 51-1178. _____

4.4.2 **ENSURE** the following valves are closed:

- HV-51-1F047B, "1B RHR Htx Shell Side Inlet Vlv" (INLET) _____
- HV-C-51-1F048B, "1B RHR Htx Shell Side Bypass Vlv" (HEAT EXCH BYPASS) _____
- 051-1F098, "Cond Trans Fill Isol Vlv to 1A & 1B RHR Loops" (402-R11-253) (ATTACHMENT 6`) _____

4.4.3 **ENSURE** HV-51-1F004B, "1B RHR Pump Suction PCIV" (SUCTION B), closed. _____

* * UNIT 1 ONLY * *

4.4.4 **ENSURE** the following valves closed:

- HV-51-1F006B, "1B RHR Pp S/D Clg Suct Vlv (SUCTION B) _____
- HV-51-1F015B, "1B Shutdown Clg Injection PCIV" (OUTBOARD) _____
- HV-51-1F016B, "1B RHR Cnmt Spray Line Outboard PCIV" (OUTBOARD) _____
- HV-51-1F017B, "1B RHR LPCI Inj PCIV" (OUTBOARD B) _____
- HV-51-1F024B, "1B RHR Pp Full Flow Test Return Vlv" (SUPP POOL CLG B) _____
- HV-51-1F027B, "1B RHR Supp Pool Spray Line PCIV" (SUPP POOL SPRAY) _____

CAUTION

IF a LOCA signal is present
AND differential pressure across HV-51-1F017B, "1B RHR LPCI Inj PCIV," (OUTBOARD B) drops below 74 psid,
THEN injection valve will automatically open
AND Fire System will add inventory to the vessel.

4.4.5 Throttle **OPEN** HV-51-1F027B, "1B RHR Supp Pool Spray Line PCIV" (SUPP POOL SPRAY) at 10C601 (Main Control Room) to spray suppression pool. _____

* * UNIT 1 ONLY * *

4.4.6 **ENSURE** fire pump running as follows:

1. **IF** starting 00P512, "Motor Driven Fire Pump,"
THEN DEPRESS HS-22-002-1 at 00C650 (Main Control Room)
AND VERIFY pump starts. _____

   a. **IF** 00P512, "Motor Driven Fire Pump," does **not** start from 00C650,
   THEN PERFORM one of the following:

      1. **GO TO** step 4.4.6.2 to start the diesel driven fire pump from the Main Control Room. _____

      2. **START** 00P512, "Motor Driven Fire Pump," from the Circ Water Pump House by depressing HS-22-002-2 at 00C518
      AND VERIFY pump starts. _____

2. **IF** starting 00P511, "Diesel Driven Fire Pump,"
THEN DEPRESS HS-22-026-1 at 00C650 (Main Control Room)
AND VERIFY pump is running. _____

   a. **IF** 00P511, "Diesel Driven Fire Pump," does **not** start from 00C650,
   THEN PERFORM one of the following:

      1. **GO TO** step 4.4.6.1 to start the motor driven fire pump from the Main Control Room. _____

* * UNIT 1 ONLY * *

2. **START** 00P511, "Diesel Driven Fire Pump," from the Diesel Fire Pump Room as follows:

   a. **PLACE** control switch at 00C519 (Diesel Fire Pump Room) in "MANUAL A"
   AND DEPRESS
   AND HOLD HS-22-026-2 until diesel starts. _____

   b. **IF** diesel did **not** start,
   THEN PLACE control switch in "MANUAL B" at 00C519
   AND DEPRESS
   AND HOLD HS-22-026-2 until diesel starts. _____

   c. **VERIFY** 00P511, "Diesel Driven Fire Pump," starts. _____

3. **IF** 00P1512, "Motor Driven Fire Pump,"
   AND 00P511, "Diesel Driven Fire Pump," are not available,
   THEN PLACE control switch for 10P402, "Backup Diesel Driven Fire Pump," in "TEST" at 10C096 (Lower Parking Lot Pump Enclosure)
   AND VERIFY pump starts. _____

4.4.7 **WHEN** shutdown of Suppression Pool Spray Using Fire Protection System Crosstie is required
THEN PERFORM section **4.10**. _____

* * UNIT 1 ONLY * *

4.5 INITIATING DRYWELL SPRAY USING RHR

4.5.1 **ENSURE** HV-51-1F004A(B), "1A(B) RHR Pump Suction PCIV" (SUCTION A(B)), open _____

4.5.2 **ENSURE** the following valves closed:

- HV-51-1F006A(B), "1A(B) RHR Pp S/D Clg Suct Intertie Vlv" (SUCTION A(B)) _____
- HV-51-1F015A(B), "1A(B) Shutdown Clg Injection PCIV" (OUTBOARD A(B)) _____
- HV-51-1F016A(B), "1A(B) RHR Cntmt Spray Line Outboard PCIV" (OUTBOARD A(B)) _____
- HV-51-1F017A(B), "1A(B) RHR LPCI Inj PCIV" (OUTBOARD A(B)) _____

4.5.3 **IF** RHR pump **not** running
THEN START 1A(B)P202 "RHR Pump." _____

4.5.4 **ENSURE** the following valves open:

- HV-51-1F047A(B), "1A(B) RHR Htx Shell Side Inlet Vlv" (INLET) _____
- HV-51-1F003A(B), "1A(B) RHR Htx Shell Side Outlet Vlv" (OUTLET) _____
- HV-C-51-1F048A(B), "1A(B) RHR Htx Shell Side Bypass Vlv" (HEAT EXCH BYPASS) _____

4.5.5 **TRIP** Reactor Recirc Pumps. _____

* * UNIT 1 ONLY * *

4.5.6 **REMOVE** Drywell Cooling Fans from service by placing all 16 Drywell Cooler Fan switches to "OFF." _____

4.5.7 **IF** Drywell High Pressure
AND LOCA signals are present,
THEN GO TO step 4.5.11. _____

4.5.8 **IF** Drywell High Pressure
AND LOCA signals are **not** present,
THEN PERFORM step 4.5.9 for A Loop Operation
OR step 4.5.10 for B Loop Operation. _____

4.5.9 **PERFORM** the following to initiate LOCA signal for A Loop:

1. **PLACE** E11A-S61A, INITIATION, switch for A Loop operation at panel 10C601 (Main Control Room) to "ARM." _____

2. **DEPRESS**
AND RELEASE E11A-S61A. _____

3. **VERIFY** LOOP A INJECTION white indicating light Lit. _____

4. **IF** LOOP A INJECTION white indicating light **not** Lit,
THEN INSTALL the following jumpers:

   - Jumper from FFF5-7 to FFF5-6 at 10C617 Bay A (Aux Equip Room) (ATTACHMENT 1) _____
   - Jumper from FFF9-2 to FFF9-1 at 10C617 Bay B (Aux Equip Room) (ATTACHMENT 2) _____

* * UNIT 1 ONLY * *

4.5.10 **PERFORM** the following to initiate LOCA signal for B Loop:

1. **PLACE** E11A-S61B, INITIATION, switch for B Loop operation at panel 10C601 (Main Control Room) to ARM." _____

2. **DEPRESS** AND **RELEASE** E11A-S61B. _____

3. **VERIFY** LOOP B INJECTION white indicating light Lit. _____

4. **IF** LOOP B INJECTION white indicating light **not** Lit, **THEN INSTALL** the following jumpers:

   - Jumper from EEE2-16 to EEE2-17 at 10C618 Bay B (Aux Equip Room) (ATTACHMENT 3) _____

   - Jumper from GGG7-11 to GGG7-12 at 10C618 Bay A (Aux Equip Room) (ATTACHMENT 4) _____

4.5.11 **OPEN** HV-51-1F024A(B), "1A(B) RHR Pp Full Flow Test Return Vlv" (SUPP POOL CLG A(B)), AND **OBTAIN** flow of 9,250 to 10,500 gpm as indicated on FI-51-1R603A(B), FL. _____

4.5.12 **OPEN** only one loop HV-51-1F021A(B), "1A(B) RHR Cntmt Spray Line Inboard PCIV" (INBOARD). _____

4.5.13 **REQUEST** SSV verify drywell temperature AND drywell pressure are on SAFE side of Drywell Spray Initiation Limit Curve per T-102, Primary Containment Control
OR SAMP-1, RPV and Primary Containment Flooding Control. _____

* * UNIT 1 ONLY * *

CAUTION

1. Slowly throttling open Outboard Drywell Spray valve will prevent rapid pressure drop.
2. Exceeding 11,000 gpm through RHR Heat Exchanger as indicated on flow indicator, FI-51-1R603A(B), FL, may cause Heat Exchanger damage.

4.5.14 Throttle **OPEN** only one loop HV-51-1F016A(B), "1A(B) RHR Cntmt Spray Line Outboard PCIV" (OUTBOARD) to initiate spray
AND OBSERVE raising flowrate as indicated on FI-51-1R603A(B), FL. _____

4.5.15 **MONITOR** Drywell pressure. _____

4.5.16 Throttle **OPEN** HV-51-1F016A(B), "1A(B) RHR Cntmt Spray Line Outboard PCIV" (OUTBOARD)
AND Fully **CLOSE** HV-51-1F024A(B),"1A(B) RHR Pp Full Flow Test Return Vlv", (SUPP POOL CLG A(B))
AND OBTAIN flow of 9,250 to 10,500 gpm as indicated on FI-51-1R603A(B), FL _____

4.5.17 **PLACE** RHR Service Water Pump for RHR Heat Exchanger to be used in service per S12.1.A, RHR Service Water System Startup. _____

NOTE

HV-C-51-1F048A will **not** close until 3 minute time delay is expired.

4.5.18 **CLOSE** HV-C-1F048A(B), "1A(B) RHR Htx Shell Side Bypass Valve" (HEAT EXCHANGER BYPASS). _____

* * UNIT 1 ONLY * *

4.5.19 **IF** HV-51-1F017A(B) "1A(B) RHR LPCI Inj PCIV" (OUTBOARD A(B)) opens,
THEN REFER to T-102, Primary Containment Control,
OR SAMP-1 RPV and Primary Containment Flooding Control
AND TERMINATE Drywell Spray
OR PREVENT LPCI Injection to prevent pump runout as directed. _____

4.5.20 **IF** shutdown of LPCI injection is required,
THEN PERFORM the following:

1. **WHEN** HV-51-1F017A(B), "1A(B) RHR LPCI Inj PCIV" (OUTBOARD A(B)) begins to open,
THEN PLACE handswitch to "CLOSE" to energize
override feature. _____

2. **PULL-TO-STOP** HV-51-1F017A(B), OUTBOARD. _____

3. **CLOSE** HV-51-1F017A(B), OUTBOARD. _____

4.5.21 **WHEN** shutdown of Drywell Spray using RHR is required,
THEN PERFORM section **4.11**. _____

* * UNIT 1 ONLY * *

4.6 INITIATING DRYWELL SPRAY USING RHR SERVICE WATER

4.6.1 **ENSURE** 1BP202, "RHR Pump" **not** running. _____

4.6.2 **ENSURE** the following valves closed:

- HV-51-1F004B, "1B RHR Pump Suction PCIV" (SUCTION B) _____
- HV-51-1F006B, "1B RHR Pp S/D Clg Suct Intertie Vlv" (SUCTION B) _____
- HV-51-1F015B, "1B Shutdown Clg Injection PCIV" (OUTBOARD) _____
- HV-51-1F016B, "1B RHR Cntmt Spray Line Outboard PCIV" (OUTBOARD) _____
- HV-51-1F017B, "1B RHR LPCI Inj PCIV" (OUTBOARD B) _____
- HV-51-1F024B, "1B RHR Pp Full Flow Test Return Vlv" (SUPP POOL CLG B) _____
- HV-51-1F027B, "1B RHR Supp Pool Spray Line PCIV" (SUPP POOL SPRAY) _____
- HV-51-1F047B, "1B RHR Htx Shell Side Inlet Vlv" (INLET) _____
- HV-C-51-1F048B, "1B RHR Htx Shell Side Bypass Vlv" (HEAT EXCH BYPASS) _____
- 051-1F098, "Cond Trans Fill Isol Vlv to 1A & 1B RHR Loops" (402-R11-253) (ATTACHMENT 6) _____

* * UNIT 1 ONLY * *

4.6.3 **PLACE** the following handswitch in "BYPASS" at 00C667 (Main Control Room) to prevent an inadvertent trip:

- HSS-012-002B, "B/D RHRSW Pump RHR Htx Hi Rad Trip Keylock Bypass B/D" (B/D) _____

4.6.4 **PLACE** RHR Service Water Loop B in service using B
OR D RHR Service Water pump per S12.1.A, RHR Service Water System Startup. _____

4.6.5 **TRIP** Reactor Recirc Pumps. _____

4.6.6 **REMOVE** Drywell Cooling Fans from service by placing all 16 Drywell Cooler Fan switches to "OFF." _____

4.6.7 **IF** Drywell High Pressure
AND LOCA signals are present,
THEN GO TO step 4.6.10. _____

4.6.8 **IF** Drywell High Pressure
AND LOCA signals are **not** present,
THEN PERFORM step 4.6.9. _____

* * UNIT 1 ONLY * *

4.6.9 **PERFORM** the following to initiate LOCA signal for B Loop:

1. **PLACE** E11A-S61B, INITIATION, switch for B Loop operation at panel 10C601 (Main Control Room) to "ARM." _____

2. **DEPRESS AND RELEASE** E11A-S61B. _____

3. **VERIFY** LOOP B INJECTION white indicating light Lit. _____

4. **IF** LOOP B INJECTION white indicating light **not** Lit, **THEN INSTALL** the following jumpers:

   - Jumper from EEE2-16 to EEE2-17 at 10C618 Bay B (Aux Equip Room) (ATTACHMENT 3) _____
   - Jumper from GGG7-11 to GGG7-12 at 10C618 Bay A (Aux Equip Room) (ATTACHMENT 4) _____

CAUTION

IF a LOCA signal is present
AND differential pressure across HV-51-1F017B, "1B RHR LPCI Inj PCIV" (OUTBOARD B) drops below 74 psid,
THEN injection valve will automatically open
AND RHR Service Water will add inventory to the vessel.

4.6.10 **OPEN** the following RHR Service Water/RHR Emergency Crosstie Valves at 10C601 (Main Control Room):

- HV-51-1F073, "RHR Service Water Crosstie" (CROSSTIE) _____
- HV-51-1F075, "RHR Service Water Crosstie" (CROSSTIE) _____

* * UNIT 1 ONLY * *

4.6.11 **OPEN** HV-51-1F021B, "1B RHR Cntmt Spray Line Inboard PCIV" (INBOARD) _____

4.6.12 **REQUEST** SSV verify drywell temperature **AND** drywell pressure are on SAFE side of Drywell Spray Initiation Limit Curve per T-102, Primary Containment Control
OR SAMP-1, RPV and Primary Containment Flooding Control. _____

NOTE

Step 4.6.13 will require coordination between an Operator at 00C667 **AND** a second Operator at 10C681.

4.6.13 Simultaneously **PERFORM** the following to maintain RHR Service Water discharge pressure 75 to 120 psig as indicated on PI-12-001B-1 "Pump B/D Disch" (Px), at 00C667 (Main Control Room):

- Throttle Fully **CLOSED** HV-51-1F068B, "1B RHR Htx SW Outlet Vlv" (1B) at 00C667 (Main Control Room). _____

CAUTION

Slowly throttling open Outboard Drywell Spray valve will prevent rapid pressure drop.

- Throttle Fully **OPEN** HV-51-1F016B, "1B RHR Cntmt Spray Line Outboard PCIV" (OUTBOARD) to initiate spray
AND MAXIMIZE flowrate as indicated on FI-51-1R603B, FL. _____

* * UNIT 1 ONLY * *

4.6.14 **MONITOR** Drywell pressure. _____

4.6.15 **IF** HV-51-1F017B "1B RHR LPCI Inj PCIV" (OUTBOARD B) opens,
THEN REFER TO T-102, Primary Containment Control,
OR SAMP-1 RPV and Primary Containment Flooding Control
AND TERMINATE Drywell Spray
OR PREVENT LPCI Injection to prevent pump runout as directed. _____

4.6.16 **IF** shutdown of LPCI injection is required,
THEN PERFORM the following:

1. **WHEN** HV-51-1F017B, "1B RHR LPCI Inj PCIV" (OUTBOARD B) begins to open,
THEN PLACE handswitch to "CLOSE" to energize override feature. _____

2. **PULL-TO-STOP** HV-51-1F017B, OUTBOARD. _____

3. **CLOSE** HV-51-1F017B, OUTBOARD. _____

4.6.17 **WHEN** shutdown of Drywell Spray using RHR Service Water is required,
THEN PERFORM section **4.12**. _____

* * UNIT 1 ONLY * *

4.7 INITIATING DRYWELL SPRAY USING FIRE PROTECTION SYSTEM CROSSTIE

4.7.1 **ENSURE** 1BP202, "RHR Pump" **not** running. _____

4.7.2 **ENSURE** the following valves closed:

- HV-51-1F004B, "1B RHR Pump Suction PCIV" (SUCTION B) _____
- HV-51-1F006B, "1B RHR Pp S/D Clg Suct Intertie Vlv" (SUCTION B) _____
- HV-51-1F015B, "1B Shutdown Clg Injection PCIV" (OUTBOARD) _____
- HV-51-1F016B, "1B RHR Cntmt Spray Line Outboard PCIV" (OUTBOARD) _____
- HV-51-1F017B, "1B RHR LPCI Inj PCIV" (OUTBOARD B) _____
- HV-51-1F024B, "1B RHR Pp Full Flow Test Return Vlv" (SUPP POOL CLG B) _____
- HV-51-1F027B, "1B RHR Supp Pool Spray Line PCIV" (SUPP POOL SPRAY) _____
- HV-51-1F047B, "1B RHR Htx Shell Side Inlet Vlv" (INLET) _____
- HV-C-51-1F048B, "1B RHR Htx Shell Side Bypass Vlv" (HEAT EXCH BYPASS) _____
- 051-1F098, "Cond Trans Fill Isol Vlv to 1A & 1B RHR Loops" (402-R11-253) (ATTACHMENT 6) _____

* * UNIT 1 ONLY * *

4.7.3 **PERFORM** the following in 402-R16-253 (ATTACHMENT 5):

1. **CONNECT** hose at 51-1179 "1B RHR Fire Protection Crosstie Connection Drain Valve" **AND** Route to drain **THEN CYCLE** 51-1179 open **AND** closed to ensure piping vented. _____

2. **CONNECT** hose at 22-1430, "Fire Protection/RHR Interconnection Drain Valve" **AND** Route to drain **THEN CYCLE** 22-1430 open **AND** closed to ensure piping vented. _____

3. **CONNECT** hose to fitting downstream of 22-1429, "Fire Protection/RHR Interconnection Isolation Valve." _____

4. **CONNECT** other end of hose to 51-1178, "1B RHR Fire Protection Crosstie Connection Isolation Valve." _____

5. **OPEN** 22-1429. _____

6. **OPEN** 51-1178. _____

4.7.4 **REQUEST** SSV verify drywell temperature **AND** drywell pressure are on SAFE side of Drywell Spray Initiation Limit curve per T-102, Primary Containment Control **OR** SAMP-1, RPV and Primary Containment Flooding Control. _____

4.7.5 **TRIP** Reactor Recirc Pumps. _____

4.7.6 **REMOVE** Drywell Cooling Fans from service by placing all 16 Drywell Cooler Fan switches to "OFF." _____

* * UNIT 1 ONLY * *

4.7.7 **IF** Drywell High Pressure
AND LOCA signals are present,
THEN GO TO step 4.7.10. _____

4.7.8 **IF** Drywell High Pressure
AND LOCA signals are **not** present,
THEN PERFORM step 4.7.9. _____

4.7.9 **PERFORM** the following to initiate LOCA signal for B Loop:

1. **PLACE** E11A-S61B, INITIATION, switch for B Loop operation at panel 10C601 (Main Control Room) to "ARM." _____

2. **DEPRESS**
AND RELEASE E11A-S61B. _____

3. **VERIFY** LOOP B INJECTION white indicating light Lit. _____

4. **IF** LOOP B INJECTION white indicating light **not** Lit,
THEN PERFORM the following:

   - Jumper from EEE2-16 to EEE2-17 at 10C618 Bay B (Aux Equip Room) (ATTACHMENT 3) _____
   - Jumper from GGG7-11 to GGG7-12 at 10C618 Bay A (Aux Equip Room) (ATTACHMENT 4) _____

4.7.10 **OPEN** HV-51-1F021B, "1B RHR Cntmt Spray Line Inboard PCIV", (INBOARD)
AND HV-51-1F016B, "1B RHR Cntmt Spray Line Outboard PCIV", (OUTBOARD), at 10C601. _____

* * UNIT 1 ONLY * *

4.7.11 **ENSURE** fire pump running as follows: _____

1. **IF** starting 00P512, "Motor Driven Fire Pump,"
   THEN DEPRESS HS-22-002-1 at 00C650 (Main Control Room)
   AND VERIFY pump starts. _____

   a. **IF** 00P512, "Motor Driven Fire Pump," does **not** start from 00C650,
      THEN PERFORM one of the following:

      1. **GO TO** step 4.7.11.2. to start the diesel driven fire pump from the Main Control Room. _____

      2. **START** 00P512, "Motor Driven Fire Pump," from the Circ Water Pump House by depressing HS-22-002-2 at 00C518
         AND VERIFY pump starts. _____

2. **IF** starting 00P511, "Diesel Driven Fire Pump,"
   THEN DEPRESS HS-22-026-1 at 00C650 (Main Control Room)
   AND VERIFY pump is running. _____

   a. **IF** 00P511, "Diesel Driven Fire Pump," does **not** start from 00C650,
      THEN PERFORM one of the following:

      1. **GO TO** step 4.7.11.1. to start the motor driven fire pump from the Main Control Room. _____

* * UNIT 1 ONLY * *

2. **START** 00P511, "Diesel Driven Fire Pump," from the Diesel Fire Pump Room as follows:

   a. **PLACE** control switch at 00C519 (Diesel Fire Pump Room) in "MANUAL A"
   AND DEPRESS
   AND HOLD HS-22-026-2 until diesel starts. _____

   b. **IF** diesel did **not** start,
   THEN PLACE control switch in "MANUAL B" at 00C519
   AND DEPRESS
   AND HOLD HS-22-026-2 until diesel starts. _____

   c. **VERIFY** 00P511, "Diesel Driven Fire Pump," starts. _____

3. **IF** 00P1512, "Motor Driven Fire Pump,"
   AND 00P511, "Diesel Driven Fire Pump," are not available,
   THEN PLACE control switch for 10P402, "Backup Diesel Driven Fire Pump," in "TEST" at 10C096 (Lower Parking Lot Pump Enclosure)
   AND VERIFY pump starts. _____

4.7.12 **WHEN** shutdown of Fire Protection Crosstie to Drywell Spray required,
THEN PERFORM section **4.13**. _____

* * UNIT 1 ONLY * *

4.8 SHUTDOWN OF SUPPRESSION POOL SPRAY USING RHR

4.8.1 **WHEN** shut down of Suppression Pool Spray using RHR is required,
THEN PERFORM the following:

1. **CLOSE** HV-51-1F027A(B), "1A(B) RHR Supp Pool Spray Line PCIV" (SUPP POOL SPRAY). _____

2. **OPEN** HV-C-51-1F048A(B), "1A(B) RHR Htx Shell Side Bypass Vlv" (HEAT EXCH BYPASS). _____

3. **CLOSE** HV-51-1F024A(B), "1A(B) RHR Pp Full Flow Test Return Vlv" (SUPP POOL CLG A(B)). _____

4. **IF** RHR Pump operation **not** required for other modes of RHR operation,
THEN SHUT DOWN 1A(B)P202, "RHR Pump" (PUMP). _____

5. **IF** RHR Service Water Pump operation **not** required for other modes of RHR operation,
THEN SHUT DOWN RHR Service Water per S12.2.A, Shutdown Of RHR Service Water Pumps And System. _____

* * UNIT 1 ONLY * *

4.9 SHUTDOWN OF SUPPRESSION POOL SPRAY USING RHR SERVICE WATER

4.9.1 **WHEN** shut down of Suppression Pool Spray using RHR Service Water is required,
THEN PERFORM the following:

NOTE

Step 4.9.1.1 will require coordination between an Operator at 00C667 **AND** a second Operator at 10C601.

1. Simultaneously **PERFORM** the following **AND** maintain RHR Service Water discharge pressure 75 to 120 psig as indicated on PI-12-001B, "Pump A/C Disch" (Px), at 00C667 (Main Control Room):

   - Throttle **OPEN** HV-51-1F068B, "1B RHR Htx SW Outlet Vlv" (1B) at 00C667 (Main Control Room). _____
   - Throttle **CLOSED** HV-51-1F027B, "1B RHR Supp Pool Spray Line PCIV" (SUPP POOL SPRAY) at 10C601 (Main Control Room). _____

2. **CLOSE** the following RHR Service Water/RHR Emergency Crosstie Valves at 10C601 (Main Control Room):

   - HV-51-1F073, "RHR Service Water Crosstie" (CROSSTIE) _____
   - HV-51-1F075, "RHR Service Water Crosstie" (CROSSTIE) _____

3. **SECURE** RHRSW pump per S12.2.A, Shutdown of RHR Service Water Pumps And System. _____

4. **RETURN** HSS-012-002B, "B/D RHRSW Pump RHR Htx High Rad Trip Keylock Bypass B/D" (B/D) to "NORMAL" at 00C667 (Main Control Room) _____

* * UNIT 1 ONLY * *

4.10 SHUTDOWN OF SUPPRESSION POOL SPRAY USING FIRE PROTECTION CROSSTIE

4.10.1 **CLOSE** HV-51-1F027B "1B RHR Supp Pool Spray Line PCIV" (SUPP POOL SPRAY) at 10C601. _____

4.10.2 **IF** this Suppression Pool Spray Mode is **no** longer required
AND temporary hose hookup is to be removed
THEN GO TO Section **5.0** (step 5.3)
Otherwise **LEAVE** hose attached for future use. _____

* * UNIT 1 ONLY * *

4.11 SHUTDOWN OF DRYWELL SPRAY USING RHR

4.11.1 Throttle **OPEN** HV-51-1F024A(B), "1A(B) RHR Pp Full Flow Test Return Vlv" (SUPP POOL CLG A(B)),
AND throttle **CLOSED** HV-51-1F016A(B), "1A(B) RHR Cntmt Spray Line Outboard PCIV" (OUTBOARD), to maintain total system flow of 8,000 to 11,000 gpm. _____

4.11.2 **WHEN** shut down of Drywell Spray using RHR is required,
THEN PERFORM the following:

1. **ENSURE** HV-51-1F016A(B), "1A(B) RHR Cntmt Spray Line Outboard PCIV" (OUTBOARD), closed. _____

2. **CLOSE** HV-51-1F021A(B), "1A(B) RHR Cntmt Spray Line Inboard PCIV" (INBOARD). _____

3. **OPEN** HV-C-51-1F048A(B),"1A(B) RHR Htx Shell Side Bypass Vlv" (HEAT EXCH BYPASS). _____

4. **CLOSE** HV-51-1F024A(B), "1A(B) RHR Pp Full Flow Test Return Vlv" (SUPP POOL CLG A(B)). _____

5. **IF** RHR Pump operation **not** required for other modes of RHR operation,
THEN SHUT DOWN 1A(B)P202, "RHR Pump" (PUMP). _____

6. **IF** RHR Service Water Pump operation **not** required for other modes of RHR operation,
THEN SHUT DOWN RHR Service Water per S12.2.A, Shutdown Of RHR Service Water Pumps And System. _____

* * UNIT 1 ONLY * *

4.12 SHUTDOWN OF DRYWELL SPRAY USING RHR SERVICE WATER

4.12.1 **WHEN** shutdown of Drywell Spray using RHR Service Water is required,
THEN PERFORM the following:

NOTE

Step 4.12.1.1 will require coordination between an Operator at 00C667 **AND** a second Operator at 10C601.

1. Simultaneously **PERFORM** the following **AND** maintain RHR Service Water discharge pressure 75 to 120 psig as indicated on PI-12-001B, "Pump B/D Disch" (Px), at 00C667 (Main Control Room):

   - Throttle **OPEN** HV-51-1F068B, "1B RHR Htx SW Outlet Vlv" (1B) at 00C667 (Main Control Room). _____

   - **CLOSE** HV-51-1F016B, "1B RHR Cntmt Spray Line Outboard PCIV" (OUTBOARD) at 10C601(Main Control Room). _____

   - **CLOSE** HV-51-1F021B, "1B RHR Cntmt Spray Line Inboard PCIV" (INBOARD) at 10C601(Main Control Room). _____

2. **CLOSE** the following RHR Service Water/RHR Emergency Crosstie Valves at 10C601 (Main Control Room):

   - HV-51-1F073, "RHR Service Water Crosstie" (CROSSTIE) _____

   - HV-51-1F075, "RHR Service Water Crosstie" (CROSSTIE) _____

* * UNIT 1 ONLY * *

3. **SECURE** RHR Service Water pump per S12.2.A, Shutdown of RHR Service Water Pumps And System. _____

4. **RETURN** HSS-012-002B, "B/D RHRSW Pump RHR Htx High Rad Trip Keylock Bypass B/D" (B/D) to "NORMAL" at 00C667 (Main Control Room) _____

4.13 SHUTDOWN OF DRYWELL SPRAY USING FIRE PROTECTION CROSSTIE

4.13.1 **CLOSE** HV-51-1F016B, "1B RHR Cntmt Spray Line Outboard PCIV", (OUTBOARD), **AND** HV-51-1F021B,"1B RHR Cntmt Spray Line Inboard PCIV", (INBOARD) at 10C601. _____

4.13.2 **IF** this Drywell Spray Mode is **no** longer required **AND** temporary hose hookup is to be removed **THEN GO TO** Section **5.0** (step 5.3)
Otherwise **LEAVE** hose attached for future use. _____

* * UNIT 1 ONLY * *

5.0 RETURN TO NORMAL

5.1 **IF** step 4.5.9.4 was performed,
THEN REMOVE the following jumpers:

- Jumper from FFF5-7 to FFF5-6 in 10C617,Bay A _____ IV

- Jumper from FFF9-2 to FFF9-1 in 10C617, Bay B _____ IV

5.2 **IF** step 4.4.6.4., 4.6.9.4
OR 4.7.9.4 was performed,
THEN REMOVE the following jumpers:

- Jumper from EEE2-16 to EEE2-17 in 10C618,Bay B. _____ IV

- Jumper from GGG7-11 to GGG7-12 in 10C618, Bay A _____ IV

5.3 **IF** section **4.4**
OR 4.7 was completed
THEN PERFORM the following:

5.3.1 **CLOSE** 51-1178, "1B RHR Fire Protection Crosstie Connection Isolation Valve,"
AND 22-1429, "Fire Protection/RHR Interconnection Isolation Vlv" _____ IV

* * UNIT 1 ONLY * *

5.3.2 **ENSURE** hoses connected **AND OPEN** the following:

- 51-1179, "1B RHR Fire Protection Crosstie Drain Valve". _____ _____ IV

- 22-1430, "Fire Protection/RHR Interconnection Drain Vlv". _____ _____ IV

5.3.3 **CLOSE** valves, **REMOVE** hoses, **AND INSTALL** cap on the following:

- 22-1430, "Fire Protection/RHR Interconnection Drain Vlv" _____ _____ IV

- 51-1179, "1B RHR Fire Protection Crosstie Drain Valve" _____ _____ IV

5.3.4 **DISCONNECT AND RETURN** hoses to T-225/T-244 Hose Storage Locker _____ _____ IV

* * UNIT 1 ONLY * *

NOTE

Fire pumps can only be secured at local panels.

5.4 **IF** 00P512, "Motor Driven Fire Pump" was started,
THEN SECURE 00P512 at 00C518 (Circulating Water Pump House). _____
_____
IV

5.5 **IF** 00P511, "Diesel Driven Fire Pump" was started,
THEN SECURE 00P511 at 00C519 (Diesel Fire Pump Room). _____
_____
IV

5.6 **IF** 10P402, "Backup Diesel Driven Fire Pump" was started,
THEN SECURE 10P402 at 10C096 (Lower Parking Lot Pump Enclosure). _____
_____
IV

5.7 **IF** Section **4.3**, **4.4**, **4.6**
OR 4.7 was performed
THEN OPEN the following valves:

- HV-51-1F047B, "1B RHR Htx Shell Side Inlet Vlv" (INLET) _____
_____
IV

- HV-C-51-1F048B, "1B RHR Htx Shell Side Bypass Vlv" (HEAT EXCH BYPASS) _____
_____
IV

- 051-1F098, "Cond Trans Fill Isol Vlv to 1A & 1B RHR Loops" _____
_____
IV

* * UNIT 1 ONLY * *

5.8 **ENSURE** T-225 equipment returned to the following T-200 cabinets:

- Unit 1 T-200 cabinet in OSC _____
  _____
  IV

- Unit 1 T-225/T-244 Hose Storage Locker (402-R16-253) _____
  _____
  IV

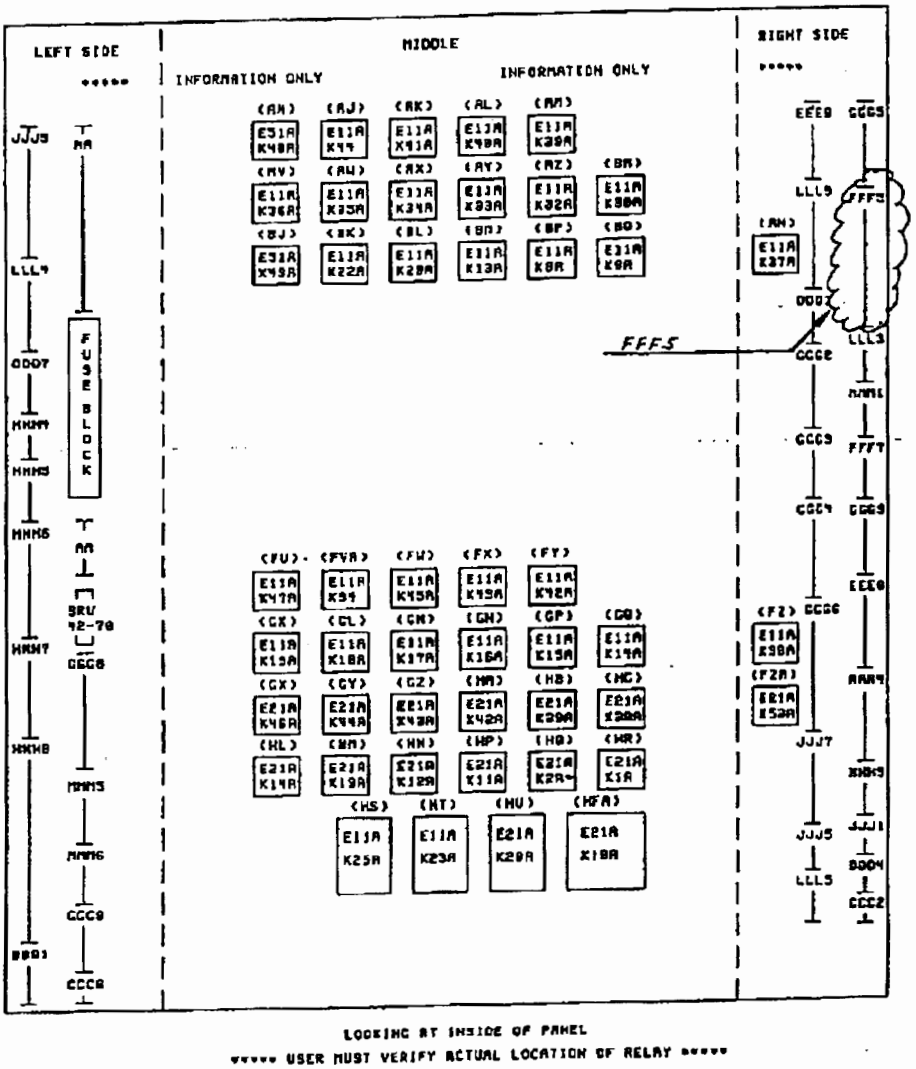
5.9 **FORWARD** completed copy to Manager, Operations Support for document retention. _____

* * UNIT 1 ONLY * *

ATTACHMENT 1
(Page 1 of 1)

Panel 10C617, Bay A
(AUX EQUIPMENT ROOM)

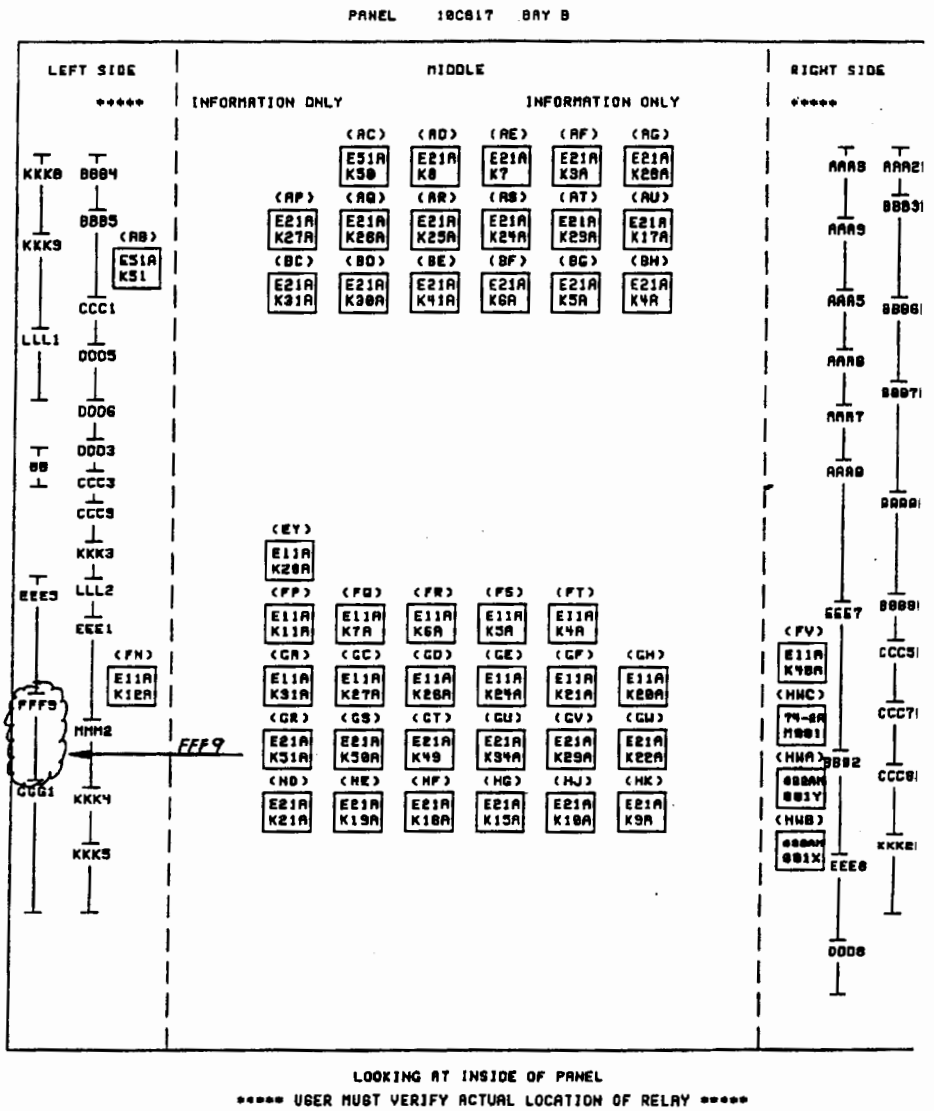
NOTE: Contacts to be jumpered have lavender banana jacks installed.



* * UNIT 1 ONLY * *

ATTACHMENT 2
(Page 1 of 1)

Panel 10C617, Bay B
(AUX EQUIPMENT ROOM)



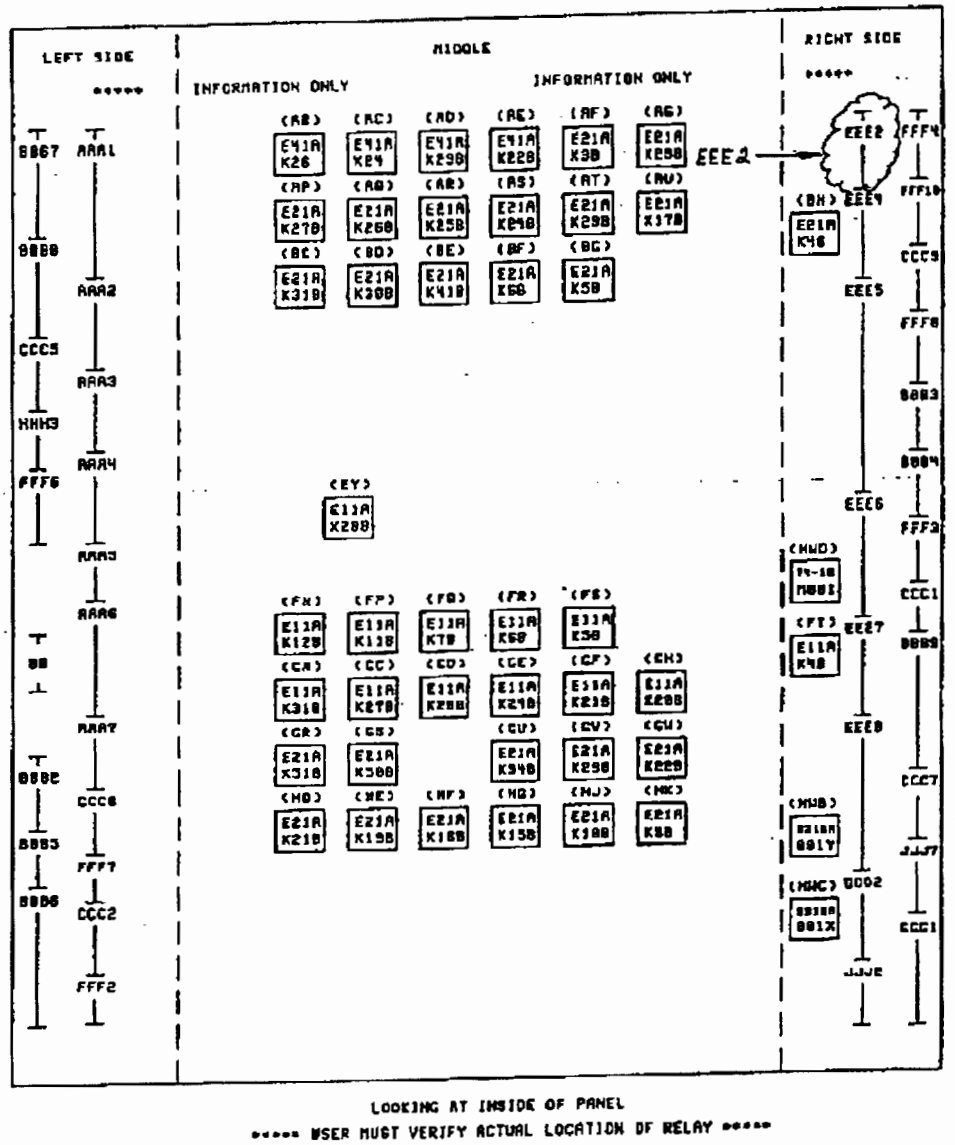
LOOKING AT INSIDE OF PANEL
***** USER MUST VERIFY ACTUAL LOCATION OF RELAY *****

* * UNIT 1 ONLY * *

ATTACHMENT 3
(Page 1 of 1)

Panel 10C618, Bay B
(AUX EQUIPMENT ROOM)

NOTE: Contacts to be jumpered have lavender banana jacks installed.

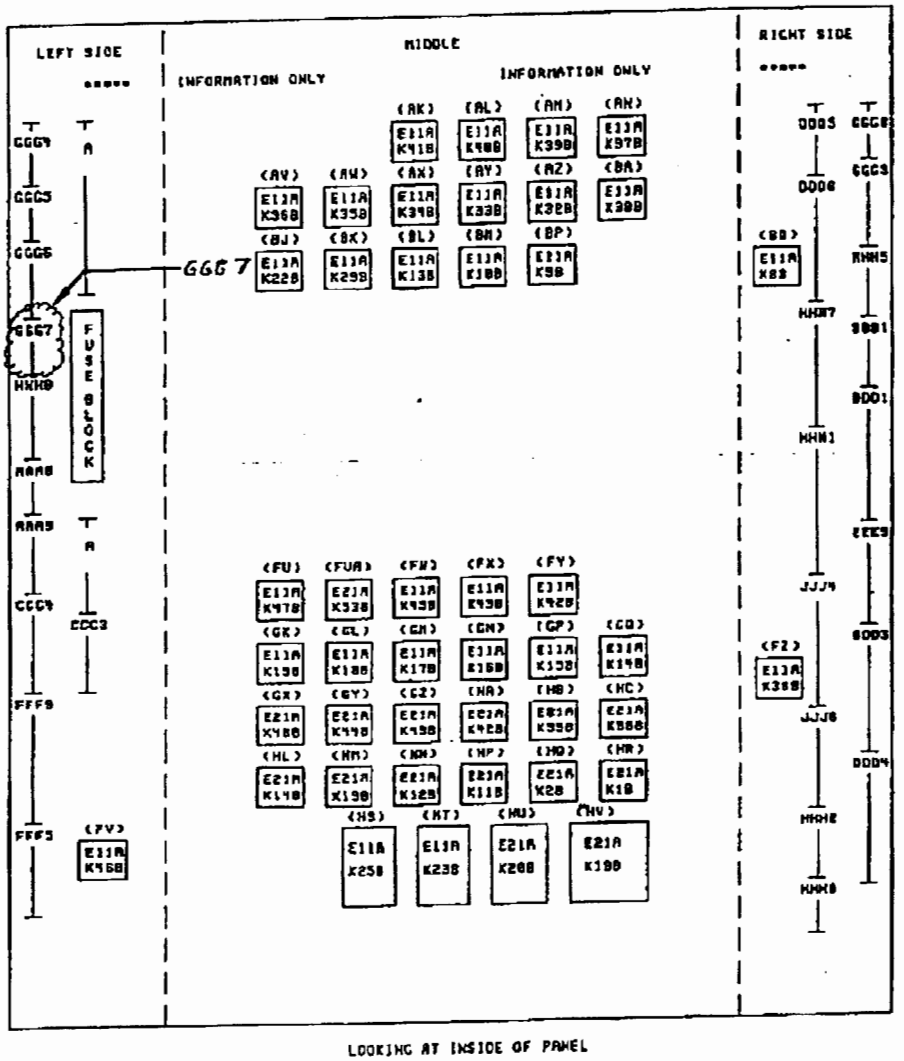


* * UNIT 1 ONLY * *

ATTACHMENT 4
(Page 1 of 1)

Panel 10C618, Bay A
(AUX EQUIPMENT ROOM)

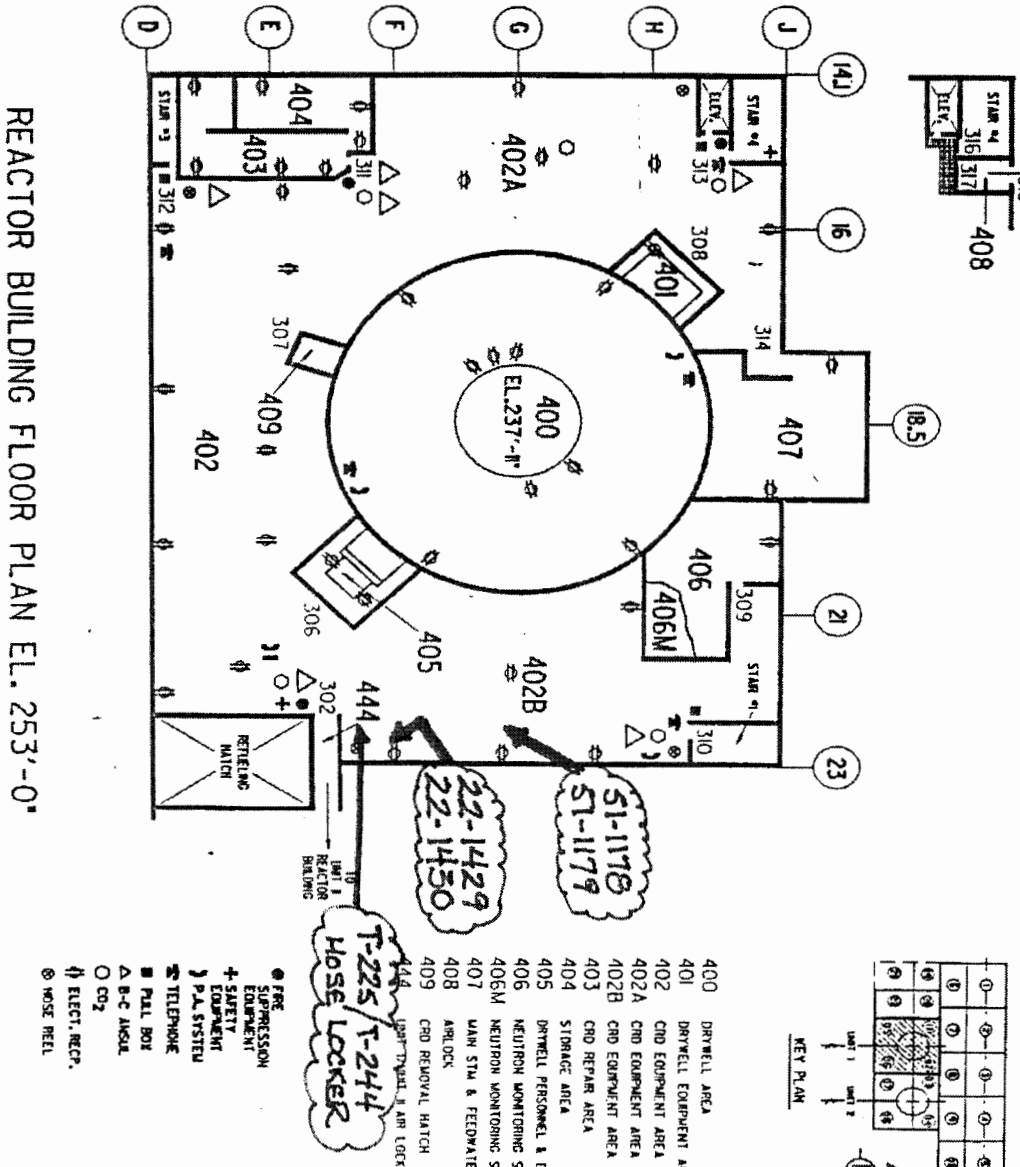
NOTE: Contacts to be jumpered have lavender banana jacks installed.



* * UNIT 1 ONLY * *

ATTACHMENT 5
(Page 1 of 1)

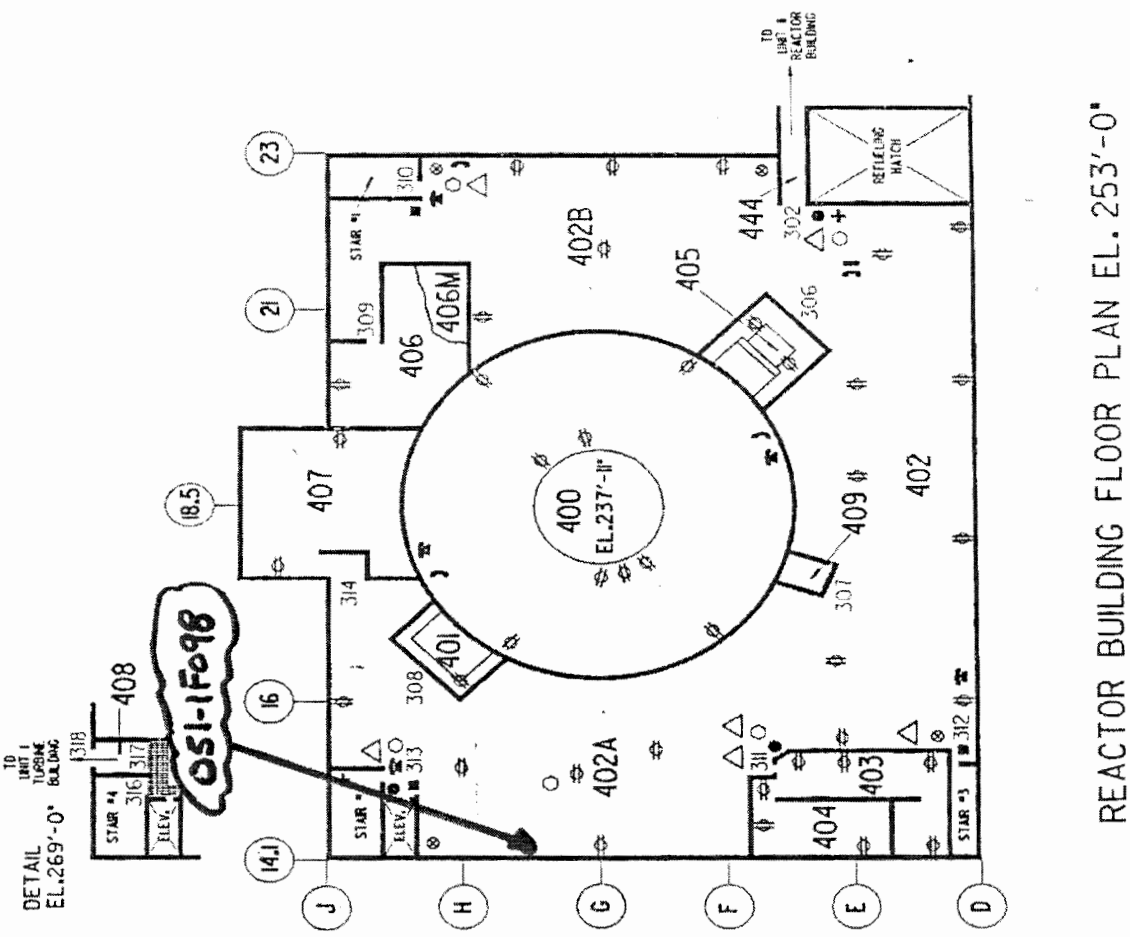
RHR - FIREWATER CROSS-TIE EQUIPMENT LOCATION



* * UNIT 1 ONLY * *

ATTACHMENT 6
Page 1 of 1

COND TRANSFER SUPPLY VALVE TO RHR LOOPS 1A & 1B LOCATION



EXELON GENERATION
LIMERICK GENERATING STATION

S12.1.A RHR SERVICE WATER SYSTEM STARTUP

1.0 PURPOSE

Align RHR Service Water System for standby **OR** manual startup.

2.0 PREREQUISITES

2.1	Correct revision of procedure being used.	[ ]
2.2	Procedure printed on white paper.	[ ]
2.3	Spray Pond Pump Structure HVAC system available. **OR** precautionary measures taken to maintain SPPH temperatures between 40°F **AND** 115°F.	[ ]
2.4	System lined up per 0S12.1.A (COL-1,(2)), Alignment for Normal Operation of the Residual Heat Removal Service Water System - Loop A(B).	[ ]
2.5	System aligned to the Cooling Tower **OR** the Spray Pond as the heat sink per S12.7.B, Utilization of Cooling Tower Or Spray Pond As a Heat Sink For RHRSW And ESW.	[ ]
2.6	RHRSW Radiation Monitors in service per S26.1.O, Placing the RHR Service Water Radiation Monitors in Service **OR** required actions of ODCM Part 1 Control 3.1.1 have been met for the INOPERABLE RHRSW Radiation Monitor.	[ ]
2.7	RHR Heat Exchanger shell side filled.	[ ]
2.8	RHRSW piping verified to be filled **AND** vented.	[ ]
2.9	Briefing performed as required.	[ ]

PLACEKEEP/INITIALS

3.0 PRECAUTIONS

3.1 For either RHRSW loop, only one of the following heat sinks may be used as a source of water at a time: [ ]

- Spray Pond

OR

- Associated Cooling Tower

3.2 **IF** RHRSW loops are aligned to different water sources,
THEN HV-012-005, PIT X-CONN GATE, must be closed. [ ]

3.3 Spray headers must be drained within one hour after use. [ ]

3.4 Starting an RHRSW Pump more than twice in one hour may result in damage to the pump motor. [ ]

3.5 **IF** HV-51-*F068A(B), HEAT EXCHANGER OUTLET, is throttled closed more than 85%,
THEN valve may be damaged, the RHRSW pump may trip on high pressure
AND RHR HX LOOP A(B) VALVES NOT OPEN annunciator will alarm. [ ]

3.6 Operation of more than one RHRSW Pump in a loop with only one heat exchanger in service in that loop would result in excessive flow
AND may result in damage to components. [ ]

3.7 Operation of 2 RHRSW Heat Exchangers in a loop with only one pump in service may result in pump runout. [ ]

3.8 **IF** HV-51-*F068A(B) is allowed to go full open during one pump per loop operation,
THEN RHRSW pump runout may occur. [ ]

3.9 Placing HSS-12-002A(B), PUMP TRIP BYPASS, in "BYPASS" position will bypass HI RAD
AND HI pump discharge pressure trips associated with the RHRSW pump. [ ]

3.10 Starting a RHRSW pump could move voids in the piping to the system radiation monitors, causing a monitor low flow alarm.
IF this occurs,
THEN manual venting of the rad monitor sensing lines is required. [ ]

PLACEKEEP/INITIALS

3.11 **WHEN** running 2 ESW Pumps
AND at least one RHRSW Pump from the same offsite power source, in the same loop
THEN ESW flow in that loop must remain > 4,000 gpm. (Ref. 5.7) [ ]

3.12 **IF** the diesel generator is supplying the safeguard bus,
THEN the following Manufactures ratings for Diesel Generator shall **not** be violated: [ ]

- 2850 KW continuous
- 3100 KW 2000 hours
- 3100 KW 4 hours in 24 hours
- 3135 KW 2 hours in 24 hours
- 3250 KW 300 hours
- 3500 KW 30 minutes (full rack)

3.13 To ensure adequate heat rejection at the spray networks during LOCA **OR** Loop conditions, limit the number of spray networks in a loop in service to equal the number of operating RHRSW pumps in the loop. [ ]

3.14 RHRSW system operation in spray should be minimized.
IF an operating RHRSW pump is **no** longer supporting a plant function (test, chemical treatment or cooling) during normal plant operation,
THEN the pump should be secured as soon as possible. (Ref. 5.13) [ ]

PLACEKEEP/INITIALS

4.0 PROCEDURE

NOTE

1. Conditional **IF...THEN** steps that are **not** applicable
   AND steps to be skipped per direction of the **IF...THEN** step shall be marked N/A
   AND initialed. [ ]

2. The procedure "Hard Card", S12.1.A Appendix 1, "RHR Service Water System Startup Hard Card", may be used for transient response. [ ]

4.1 PREPARATION FOR STARTUP

4.1.1 **VERIFY** all prerequisites satisfied. _____

4.1.2 **VERIFY** procedure being performed on correct unit/ train. _____

4.1.3 **ENSURE** RHRSW Spray Header Drain Valves on the spray headers to be placed in service closed per S12.4.A. _____

NOTE

Steps 4.1.4
AND 4.1.5 may be performed at the same time.

4.1.4 **OPEN** HV-51-*F014A(B), HEAT EXCHANGER INLET. _____ PC

4.1.5 Throttle **OPEN** HV-51-*F068A(B) for 18 to 20 seconds

OR

Perform the following to manually **OPEN** HV-51-*F068A(B):

1. **OPEN** the power supply for HV-51-*F068A(B) (D*34-R-H-19 breaker for HV-51-*F068A **OR** D*44-R-H-19 breaker for HV-51-*F068B)

2. Manually **OPEN** HV-51-*F068A(B) approximately 150 turns

_____ PC

PLACEKEEP/INITIALS

"A" RHRSW ONLY

4.1.6 **IF** the associated RHR Heat Exchanger has been drained **OR** maintenance has been performed on the associated RHR Heat Exchanger,
THEN VERIFY PI-51-*05A-1, HX DISCH, indicates system static pressure greater than or equal to 15 psig. _____

1. **IF** PI-51-*05A -1, HX DISCH, indicates system static pressure less than 15 psig,
THEN FILL system per section **4.3**. _____

"B" RHRSW ONLY

4.1.7 **IF** the associated RHR Heat Exchanger has been drained **OR** maintenance has been performed on the associated RHR Heat Exchanger,
THEN VERIFY PI-51-*05B, HX DISCH, indicates system static pressure greater than
OR equal to 15 psig. _____

1. **IF** PI-51-*05B, HX DISCH, indicates system static pressure less than 15 psig,
THEN FILL system per section **4.4**. _____

4.1.8 **IF** the HI RAD
AND/OR HI Pump Discharge pressure trips need to be bypassed
AND the required actions of ODCM Part 1 Control 3.1.1 have been met for the INOPERABLE RHRSW Radiation Monitor,
THEN PLACE HSS-12-002A(B), PUMP TRIP BYPASS, in "BYPASS." _____

PLACEKEEP/INITIALS

4.2 MANUAL START OF RHRSW

CAUTION

1. **IF** (*A) HV-51-*F068A(B) is allowed to go full open during one pump per loop operation
THEN runout of RHRSW Pump may occur. [ ]

2. Starting a pump more than twice in one hour may damage pump motor. [ ]

4.2.1 **START** 0A(B,C,D)V543, Spray Pond Room Fan as follows:

1. **IF** 'A' Loop pump (0A(C)-P506) is to be placed in service,
THEN ENSURE 0A-V543
OR 0C-V543, Spray Pond Pump Room Fans, in "RUN"
at 00C681. _____ PC

2. **IF** 'B' Loop pump (0B(D)-P506) is to be placed in service,
THEN ENSURE 0B-V543
OR 0D-V543, Spray Pond Pump Room Fans, in "RUN"
at 00C681. _____ PC

CAUTION

1. **IF** HV-51-*F068A(B) throttled more than 85% closed,
THEN valve may be damaged
AND RHR HX LOOP A(B) VALVES NOT OPEN annunciator will alarm. [ ]

2. HV-51-*F068A(B) position is maximized to avoid cavitation. [ ]

4.2.2 **START** 0A(B,C,D)P506, PUMP. _____ PC

4.2.3 **IF** **not** directed by SE-10 to operate RHRSW,
THEN THROTTLE HV-51-*F068A(B) to the maximum obtainable position without exceeding 11,000 gpm on FI-51-*R602A(B) while maintaining pump disch pressure (PI-12-001A-1(B)) between 75 psig to 85 psig. _____ PC

PLACEKEEP/INITIALS

4.2.4 **IF** directed by SE-10 to operate RHRSW
THEN perform the following (Ref. 5.12):

1. **IF** Spray Pond level ≥ 245 ft 4"
THEN THROTTLE HV-51-*F068A(B) to the maximum obtainable position without exceeding 11,000 gpm on FI-51-*R602A(B) while maintaining pump disch pressure (PI-12-001A-1(B)) between 75 psig to 85 psig. _____

2. **IF** spray pond level < 245 ft 4"
THEN THROTTLE HV-51-*F068A(B) to the maximum obtainable position without exceeding 10,700 gpm on FI-51-*R602A(B) while maintaining pump disch pressure (PI-12-001A-1(B)) between 75 psig to 85 psig. _____

4.2.5 **IF** a second pump in the loop is being started to shutdown the other unit during a LOCA mitigation,
THEN ADJUST flows as follows:

- The accident unit receives a minimum 8,250 gpm _____
- The unit being shutdown receives a minimum 5,750 gpm. _____
- Combined Loop flow no greater than 14,500 gpm. _____

4.2.6 **IF** idle RHRSW loop A(B) pump is **not** to be started,
THEN GO TO step 4.2.12. _____

4.2.7 **OPEN** idle Heat Exchanger inlet HV-51-*F014A(B). _____ PC

PLACEKEEP/INITIALS

NOTE

1. Steps 4.2.8 through 4.2.11 must be performed quickly to avoid high flow rates through the RHR Heat Exchanger. [ ]

2. **IF** discharge pressure exceeds 140 psig for greater than 5 seconds **THEN** an in-service pump will trip. [ ]

3. **IF** discharge pressure drops below 73 psig for greater than 10 seconds **THEN** the pump discharge low pressure annunciator will alarm. This alarm will **not** clear until pressure is raised above 100 psig **OR** until pump is removed from service. [ ]

4.2.8 **THROTTLE** closed in-service HV-51-*F068A(B) **AND THROTTLE** open idle HV-51-*F068A(B) until heat exchanger flows are approximately the same ensuring pump discharge pressure remains between 75 to 120 psig. _____ PC

4.2.9 **ENSURE** pump discharge pressure is 75 to 80 psig prior to pump start. _____

4.2.10 **START** idle RHRSW Pump in the loop. _____ PC

4.2.11 Throttle **OPEN** HV-51-1F068A(B) **AND** HV-51-2F068A(B) to maximum positions that obtain desired flows (15,000 to 18,000 gpm) through both heat exchangers with pump discharge pressure greater than 75 psig. _____ PC

PLACEKEEP/INITIALS

NOTE

During non-accident conditions, Loop RHRSW flow rates should be maximized in order to prevent excessive cavitation at the heat exchanger outlet valves (see limits in step 4.2.12). [ ]

4.2.12 **VERIFY** the following:

- Pump motor current is less than 92 amps on A/11503-2(11603-2). _____
- Pump discharge pressure(s) is greater than 75 psig on PI-12-001A-1(B). _____
- Steady state pump discharge pressure(s) does **not** exceed 120 psig. _____

4.2.13 **NOTIFY** chemistry that RHRSW is in operation. (Ref. 5.10) _____

CAUTION

The following step ensures the ESW & RHRSW systems are capable of removing design heat loads. Failure to align the systems in accordance with the guidance provided may result in over-heating vital safety related components. [ ]

4.2.14 **PERFORM** the following to minimize Spray Pond Temperature. (Ref 5.8 and 5.9) _____

1. **IF** Spray Pond is **not** frozen solid,
   THEN PLACE the same number of spray networks in service in each RHRSW loop as running RHRSW pumps by performing next step.

4.2.15 **IF** it is desired to transfer spray mode from "Spray to Bypass" **OR** "Bypass to Spray"
THEN PERFORM necessary steps per S12.7.A, Spray Networks To Bypass Transfer,
OR S12.7.E, Bypass To Spray Networks Transfer, respectively. _____

4.2.6 **IF** D*34-R-H-19 breaker **OR** D*44-R-H-19 breaker was opened and it is desired to energize HV-051-*F068A(B),
THEN close the associated supply breaker. _____

PLACEKEEP/INITIALS

4.3 FILLING OF RHR SERVICE WATER LOOP A USING A ESW

4.3.1 **OPEN** the following valves:

- HV-51-1F014A, "RHR Heat Exchanger SW Inlet Valve". _____ PC
- HV-51-2F014A, "RHR Heat Exchanger SW Inlet Valve". _____ PC

4.3.2 **OPEN** the following valves:

- HV-51-1F068A, "RHR Heat Exchanger SW Outlet Valve". _____ PC
- HV-51-2F068A, "RHR Heat Exchanger SW Outlet Valve". _____ PC

4.3.3 **CLOSE** HV-11-015A, "ESW A Discharge To B RHR Service Water Return." _____ PC

4.3.4 **START** ESW pump 0A(C)P548 per S11.1.A, ESW System Startup. _____

4.3.5 **WHEN** approximately 30 minutes of ESW operation has elapsed,
OR venting is complete,
THEN **SECURE** ESW pump 0A(C)P548 per S11.2.A, Emergency Service Water System Shutdown. _____

4.3.6 **VERIFY** PI-51-*05A-1 indicates system static pressure greater than 15 psig
OR **REPEAT** this section (**4.3**)
Otherwise, **CONTINUE**. _____

4.3.7 **OPEN** HV-11-015A, "ESW A Discharge To B RHR Service Water Return". _____ PC

PLACEKEEP/INITIALS

4.3.8 **CLOSE** the following valves:

- HV-51-1F068A, "RHR Heat Exchanger SW Outlet Valve". _____ PC
- HV-51-2F068A, "RHR Heat Exchanger SW Outlet Valve". _____ PC

4.3.9 **CLOSE** the following valves:

- HV-51-1F014A, "RHR Heat Exchanger SW Outlet Valve". _____ PC
- HV-51-2F014A, "RHR Heat Exchanger SW Outlet Valve". _____ PC

4.3.10 **FLUSH** RHR Heat Exchanger **not** being placed in service per S51.5.A, "Flushing of the RHR System Heat Exchanger Tube Side With Demineralized Water." _____

PLACEKEEP/INITIALS

4.4 FILLING OF RHR SERVICE WATER LOOP B USING B ESW

4.4.1 **OPEN** the following valves:

- HV-51-1F014B, "RHR Heat Exchanger SW Outlet Valve". _____ PC
- HV-51-2F014B, "RHR Heat Exchanger SW Outlet Valve". _____ PC

4.4.2 **OPEN** the following valves:

- HV-51-1F068B, "RHR Heat Exchanger SW Outlet Valve". _____ PC
- HV-51-2F068B, "RHR Heat Exchanger SW Outlet Valve". _____ PC

4.4.3 **CLOSE** HV-11-011B, "ESW B Discharge To A RHR Service Water Return." _____ PC

4.4.4 **START** ESW pump 0B(D)P548 per S11.1.A, ESW System Startup. _____

4.4.5 **WHEN** approximately 30 minutes of ESW operation has elapsed,
OR venting is complete,
THEN SECURE the ESW pump 0B(D)P548 per S11.2.A, Emergency Service Water System Shutdown. _____

4.4.6 **VERIFY** PI-51-*05B indicates system static pressure greater than 15 psig
OR REPEAT this section (**4.4**)
Otherwise, **CONTINUE**. _____

4.4.7 **OPEN** HV-11-011B, "ESW B Discharge To A RHR Service Water Return". _____ PC

PLACEKEEP/INITIALS

4.4.8 **CLOSE** the following valves:

- HV-51-1F068B, "RHR Heat Exchanger SW Outlet Valve". _____ PC
- HV-51-2F068B, "RHR Heat Exchanger SW Outlet Valve". _____ PC

4.4.9 **CLOSE** the following valves:

- HV-51-1F014B, "RHR Heat Exchanger SW Outlet Valve". _____ PC
- HV-51-2F014B, "RHR Heat Exchanger SW Outlet Valve". _____ PC

4.4.10 **FLUSH** RHR Heat Exchanger **not** being placed in service per S51.5.A, "Flushing of the RHR System Heat Exchanger Tube Side With Demineralized Water." _____

5.0 REFERENCES

5.1 M-12, P&ID - RHR Service Water

5.2 M-51, P&ID - Residual Heat Removal

5.3 SFR 216A-013, RHRSW Flow Requirements for 2 RHRSW Pumps Operating in a Single Loop

5.4 BLP-47794, PCI 20929, RHRSW Pressure Switch Problem

5.5 BLP-48161, Letter from R. J. Scholz to P. J. Duca, June 6, 1989

5.6 L. B. Pyrih letter to M. J. McCormick, Jr., dated June 27, 1990, LGS Diesel Generator Loading Limitations

5.7 BLP-44743 ESW/RHRSW System Transient Testing, Final Report

5.8 Limerick Spray Pond Heat Removal Calculation LM-350

5.9 Limerick Spray Pond Heat Removal Calculation LM-383

5.10 IR 241773

5.11 ECR 04-00433

5.12 Op Eval 11-007

5.13 IR 1346780

6.0 TECHNICAL SPECIFICATIONS

6.1 3.7.1.1

6.2 3.7.1.2

7.0 INTERFACING PROCEDURES

7.1 S11.1.A, ESW System Startup

7.2 S11.2.A, Emergency Service Water System Shutdown

7.3 S12.1.A Appendix 1, RHR Service Water System Startup Hard Card

7.4 0S12.1.A (COL01), Alignment for Normal Operation of the Residual Heat Removal Service Water System - Loop A

7.5 0S12.1.A (COL02), Alignment for Normal Operation of the Residual Heat Removal Service Water System - Loop B

7.6 S12.4.A, Draining of the RHR Service Water Spray Header

7.7 S12.7.A, Spray Networks To Bypass Transfer

7.8 S12.7.B, Utilization of Cooling Tower Or Spray Pond as a Heat Sink for RHRSW And ESW

7.9 S12.7.E, Bypass To Spray Networks Transfer

7.10 S26.1.O, Placing the RHR Service Water Radiation Monitors in Service

7.11 S51.1.A, Set Up of RHR System for Automatic Operation in LPCI Mode

7.12 S51.5.A, Flushing of the RHR System Heat Exchanger Tube Side With Demineralized Water.

7.13 S81.1.A, Startup of Miscellaneous Structure HVAC System

7.14 T-231 U/1, RHRSW to Suppression Pool

7.15 T-231 U/2, RHRSW to Suppression Pool

7.16 T-243 U/1, Alternate Injection By Way of RHRSW to RHR Loop A

7.17 T-243 U/2, Alternate Injection By Way of RHRSW to RHR Loop B

7.18 ST-6-012-620-0, RHRSW Spray Network Draining