1. 007 EK2.03 001
Given the following:

- Unit 2 was at 60% power when a reactor trip occurred as a result of an inadvertent Train "A" Feedwater Isolation Signal.
- After the plant was stabilized, the OATC observed the following on Annunciator Panel 2-XA-55-4D, Reactor First Out:
  - LS-3-97B, "STM GEN LOOP 3 LEVEL LOW-LOW REACTOR TRIP" window lit and NOT flashing.
  - "P-9 TURBINE TRIP REACTOR TRIP" window flashing.

Which ONE of the following identifies the cause of the reactor trip and the status of the Reactor Trip First Out Panel?

A. The reactor tripped due to the turbine trip;
The Reactor Trip First Out panel has been acknowledged, but NOT reset.

B✓ The reactor tripped due to the turbine trip;
The Reactor Trip First Out panel has NOT been acknowledged and the SG Low-Low level window came in after the reactor trip occurred.

C. The reactor tripped due to the SG low level;
The Reactor Trip First Out panel has been acknowledged, but NOT reset.

D. The reactor tripped due to the SG low level;
The Reactor Trip First Out panel has been acknowledged and the P-9 Turbine Trip Reactor Trip window came in after the panel was acknowledged.

DISTRACTOR ANALYSIS:

A. *Incorrect, The reactor did trip due to the turbine tripping but with the window flashing the first out annunciator has not been acknowledged. Plausible because the acknowledge function could be confused with the reset function.*

B. *CORRECT, A feedwater isolation signal will cause a turbine trip and with the reactor power greater than 50% a turbine trip will cause a reactor trip. This results in the P-9 "Turbine Trip Reactor Trip" window flashing. Subsequent windows that come into alarm will come in solid lit and not flash.*

C. *Incorrect, the reactor tripped from the turbine trip signal and the SG low-low level alarm came in after the trip. Plausible because a feedwater isolation would result in a reactor trip from low SG levels if the turbine did not get a direct trip signal from the feedwater isolation and if the first out panel was acknowledged the SG low level alarm window would solid lit.*

D. *Incorrect, the reactor tripped from the turbine trip signal and the SG low-low level alarm came in after the trip. Plausible because a feedwater isolation would result in a reactor trip from low SG levels if the turbine did not get a direct trip signal from the feedwater isolation and acknowledgement of alarms on other annunciator panels would result in the acknowledged window being lit solid and subsequent alarms flashing.*

Question No. 1

Tier 1 Group 1

K/A 007 EK2.03
Knowledge of the interrelations between a reactor trip and the following:
Reactor trip status panel

Importance Rating: 3.5 / 3.6

Technical Reference: OPT200ANN, Annunciator System, Rev. 3

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL200ANN B.4 e & f
Describe the following characteristics of each major component in the Annunciator System:
e. Component Operation
f. Controls

Question Source:
Bank # __________
Modified Bank # __________
New _X_____

Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge _______
Comprehension or Analysis __X____

10 CFR Part 55 Content: (41.7 / 45.7)

10CFR55.43.b (n/a)

Comments: New question for 1/2009 NRC exam

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** ANNUNCIATOR SYSTEM

IV. **LENGTH OF LESSON:** 3 hour lecture; 1/2 hour simulator demonstration; 1 hour self-study/workshop workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Annunciator System in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with the Annunciator System as identified in Appendix A.
1. State the purpose/functions of the Annunciator System as described in the SQN FSAR.
2. State the design basis of the Annunciator System in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the Annunciator System as illustrated on a simplified system drawing.
4. Describe the following characteristics of each major component in the Annunciator System:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the components are designed
   m. Location of controls and indications in the control room and auxiliary control room

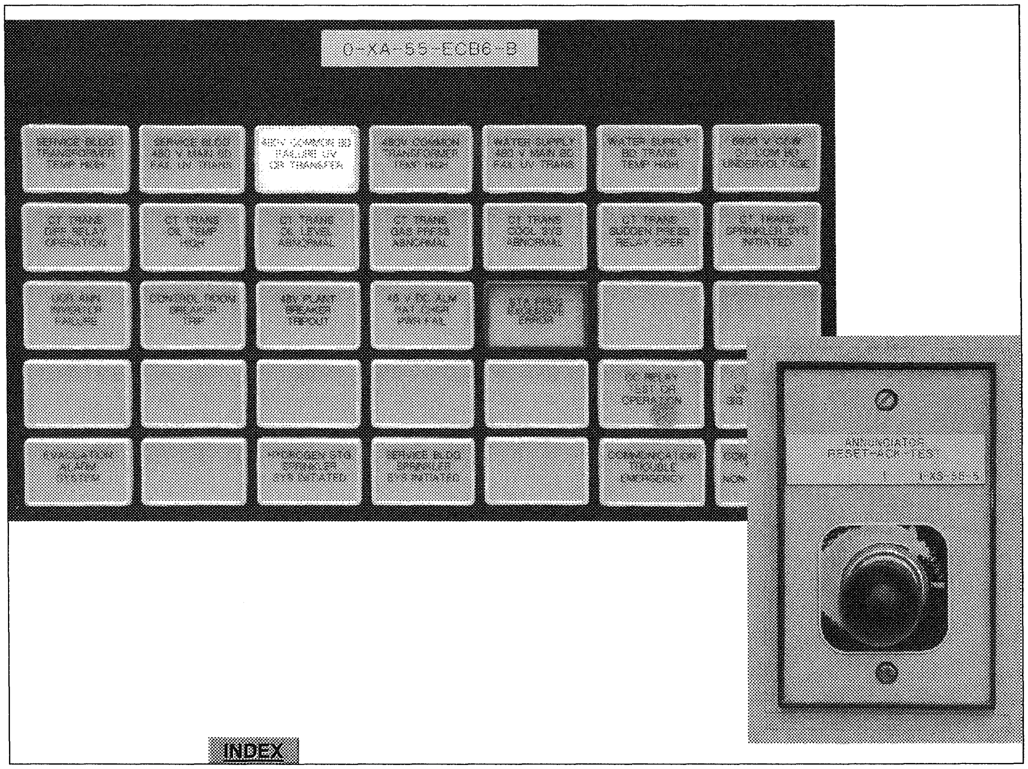
V. TRAINING OBJECTIVES (Cont'd):

B. Enabling Objectives (Cont'd):

5. Describe the operation of the Annunciator System:
   a. Precautions and limitations
   b. Major steps performed while placing the system in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect system operation
   f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the Annunciator System:
   a. State Tech Specs/TRM LCOs that govern the system.
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events

VI. TRAINING AIDS:

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)



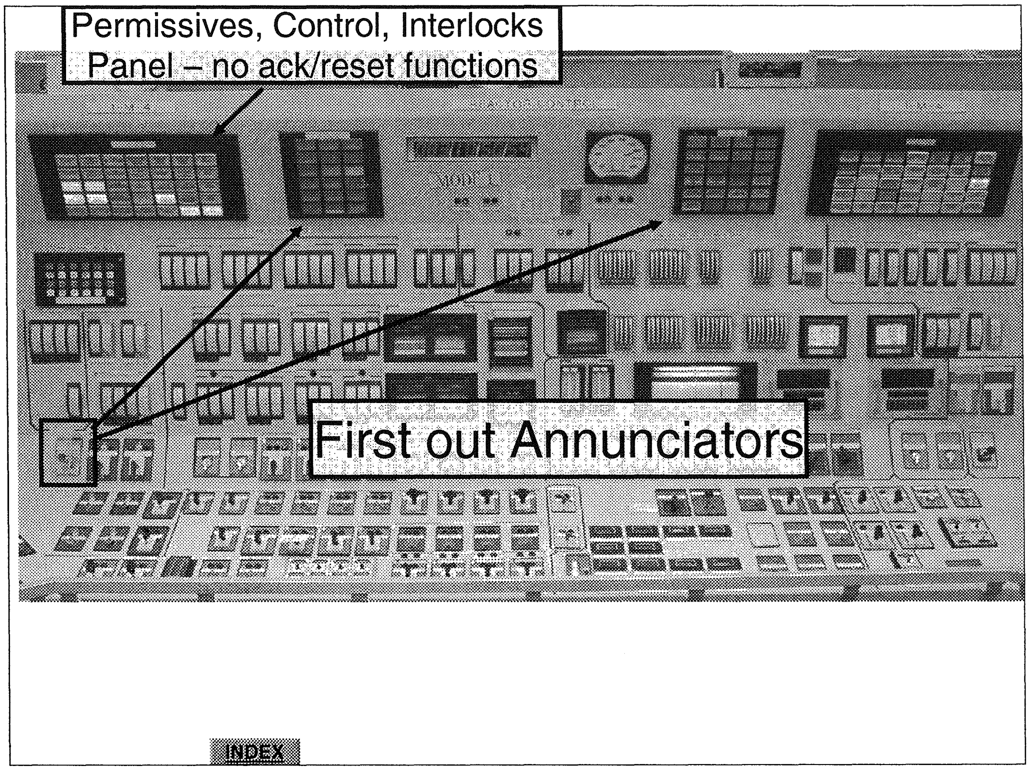
X. LESSON BODY

D. Major Components

Annunciator Windows

- Acknowledge – Changes flashing lights to stead and silences audible
- Reset – Resets alarm (flashing) when alarm condition is cleared
- Test – lights all window to very lamp functionality

Instructor Note: These switches do not acknowledge/reset the CRT alarm screens - CRTs must be ACK & reset independently of window boxes.



X. LESSON BODY

D. Major Components

Annunciator Windows

Instructor Note: Point out the first out, permissives, normal alarm panel and reset switch(s)

- First out Annunciator Windows have a plastic cover on the acknowledge/reset switch – otherwise function similarly
- Permissives, control, interlock panel has no need of acknowledge/reset functions.

2. 008 AG2.4.45 002

Given the following:

- Unit 2 operating at 100% steady-state power.
- A Pressurizer safety valve fails partially open resulting in the crew initiating a manual Reactor Trip and Safety Injection.
- The crew observed the following post-trip indications:
  - Pressurizer pressure: 1820 psig and lowering
  - Pressurizer level: 53% and rising
  - PRT pressure: 45 psig and rising

Based on the above, which ONE of the following annunciators would indicate an additional event has occurred?

A. PRESSURIZER RELIEF TANK TEMP HIGH

B. ROD CONTROL SYSTEM URGENT FAILURE

C✓ MS-30-241 LOWER COMPT MOISTURE HIGH

D. LS-68-335 D/E PRESSURIZER LEVEL HIGH-LOW

<u>*DISTRACTOR ANALYSIS:*</u>

A. Incorrect, with the pressurizer safety valve leaking , the PRT high temperature annunciator would be expected to be in alarm. plausible because the PRT receives other inputs that could be causing the high temperature alarm if the safety valve were not open.

B. Incorrect, The rod control urgent failure resulted from the de-energizing of the control rod drive coils when the reactor tripped and as such would be expected for the identified conditions. Plausible if the urgent failure alarm being an expected alarm due to the trip is not applied.

C. CORRECT, The pressurizer relief tank pressure has not risen sufficiently to rupture the PRT , therefore with the Containment Moisture alarm in something else much be leaking into containment.

D. Incorrect, The pressurizer level high-low alarm would be in due to the resulted the pressurizer level being >5% above setpoint following the trip would be expected. With Tavg lowering toward 547°F following the trip, the level should be 25% and the actual level is 53%. Plausible because alarm also comes in when level is greater than 5% below setpoint and the level is less than 5% below the normal level setpoint. If this logic is applied, then a leak in addition to the safety valve could be concluded.

Question No. 2

Tier 1 Group 1

K/A 008 AG2.4.45
Pressurizer Vapor Space Accident
Ability to prioritize and interpret the significance of each annunciator or alarm.

Importance Rating: 4.1 / 4.3

Technical Reference: 1-AR-M5-A, Reactor Coolant - STM - FW, Rev 31
1-AR-M5-C, Ventilation, Rev 18
1-SO-68-5, Pressurizer Relief Tank, Rev 18

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271E-1 B.7; OPT200.PZRPCS

Question Source:
Bank # __________
Modified Bank # __________
New ___X____

Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge _______
Comprehension or Analysis ___X____

10 CFR Part 55 Content: (41. 7, 41.13 / 43.5)

10CFR55.43.b (n/a)

Comments: New for SQN Exam 1/2009

2.2 Developmental References

A. SOI-68.1, *Reactor Coolant System*

B. 0-MI-MXX-068-006.0, *Venting of Pressurizer, Pressurizer Relief Tank, and Reactor Head*

C. SPP-10.3, *Verification Program*

D. TVA Drawing

1. 47W813-1
2. 47W819-1
3. 47W830-1
4. 47W830-6

E. FSAR

1. Section 5.5

3.0 PRECAUTIONS AND LIMITATIONS

A. During normal operation, PRT water temperature should not exceed 120°F.

B. Maintaining 3 to 6 psi**g** N_2 gas blanket on the PRT will prevent the formation of explosive hydrogen-oxygen mixtures.

C. The PRT concentration of oxygen shall be limited to less than or equal to 2% by volume whenever the hydrogen concentration exceeds 4% by volume.

D. Over filling the PRT to solid water condition during oxygen reduction per Section 8.8 may result in failure of the PRT rupture disc.

E. The PRT pressure should be maintained < 7.5 psi**g** during normal operation. (Except during the performance of section 8.9).

F. The PRT rupture discs are rated at 85 psi**g**.

G. The level in the PRT should be maintained at 70%. If the level increases to 88%, then decreasing level to 70% is necessary. If the level decreases to 55%, then increasing level to 70% is needed when the PRT is required to be operable.

H. Completely draining the PRT may result in gas binding the RCDT pumps.

I. Water intrusion into the waste gas vent header is possible during PRT venting operations with PRT level high. This could affect RCP seal leakoff flows and the vent capability of tanks which vent to waste gas vent header.

J. PRT level indications or alarms are not available in the Aux Control Room, thus PRT level manipulations and feed & bleed processes are unavailable.

Source	Setpoint	
SER2112 LS-68-335D/E - High SER 2113 LS-68-339F/E - Low	70% span increasing 5 percent of span deviation below level program	**LS-68-335D/E PRESSURIZER LEVEL HIGH-LOW**

Probable Causes

1. RCS leak exceeding charging capacity.
2. Load transient or RCS temperature transient condition.
3. Charging and/or letdown flow mismatch.
4. Instrument malfunction for level or Tavg.

NOTE Changes in pressurizer heater/spray operation may cause small reactivity changes due to:
- Differences in boron concentration between Pzr & Loops or
- Changes in pressure due to pressure coefficient of reactivity.

Corrective Actions

[1] **CHECK** pressurizer level (1-LI-68-339A, 335A, 320)

[2] **IF** level is high, **THEN**
ENSURE backup heaters ON.

[3] **ENSURE** level control system is attempting to return level to program with letdown and charging.

[4] **IF** level channel failed, **THEN**
GO TO AOP-I.04, Pressurizer Instrument Malfunction.

[5] **IF** RCS leakage is suspected, **THEN**
GO TO AOP-R.05, RCS Leak and Leak Source Identification.

[6] **IF** in MODE 4 or MODE 5 and a LOCA is identified, **THEN**
GO TO AOP-R.02, Shutdown LOCA (MODE 4, or 5).

[7] **EVALUATE** Technical Specifications 3.3.1, 3.3.2 and 3.4.6.2 as applicable.

References

45B655-05A-0,
47B601-68-45

Source	Setpoint	
SER 2109 1-TS-68-309	132°F increasing	**TS-68-309 PRESSURIZER RELIEF TANK TEMP HIGH**

Probable Causes

1. Pressurizer safety valve or power relief valve open or leaking through.
2. Other relief valves (CVCS and RHR) or valve packing leakoff lines connected to PRT header have flow into the PRT.
3. Rx vessel head vent system leaking through.
4. Instrument malfunction.

Corrective Actions

[1] **CHECK** pressurizer relief tank temperature (1-TI-68-309).

[2] **CHECK** temperature on safety valve and power relief valve line.

[3] **VERIFY** vessel head vent isolation to PRT closed (1-HS-68-394 and 1-HS-68-395).

[4] **ADJUST** pressurizer relief tank temperature using 1-SO-68-5, *Pressurizer Relief Tank.*

[5] **IF** in MODE 4 or MODE 5 and a LOCA is identified, **THEN**
GO TO AOP-R.02, Shutdown LOCA (MODE 4, or 5).

[6] **IF** a small RCS leak is indicated, **THEN**
GO TO AOP-R.05, RCS Leak and Leak Source Identification.

[7] **EVALUATE** TS 3.4.6.2.

References

45B655-05A-0,
47B601-68-34

Source

SER 357
1-PS-68-301

Setpoint

8 psig increasing

PS-68-301 PRESSURIZER RELIEF TANK PRESS HIGH

Probable Causes

1. Pressurizer safety valve or power relief valve open or leaking through.
2. Nitrogen regulator malfunctioning.
3. Rx vessel head vent leaking through.
4. Relief valves from other systems open or leaking through.
5. Instrument malfunction.

Corrective Actions

[1] **IF** pressurizer relief tank pressure is high, **THEN**
PERFORM the following for possible causes of high pressure:
[a] **CHECK** safety valve and power relief valve line temperatures.
[b] **CHECK** vessel head vent isolation to PRT closed.
[c] **CHECK** nitrogen system.

[2] **REDUCE** pressure in PRT by using 1-SO-68-5, *Pressurizer Relief Tank.*

[3] **IF** a small RCS leak is indicated, **THEN**
GO TO AOP-R.05, *RCS Leak And Leak Source Identification.*

[4] **EVALUATE** TS 3.4.6.2.

References

45B655-05A-0,
45N657-16,
47B601-68-32

ROD CONTROL SYSTEM URGENT FAILURE

Source

SER 306

Logic Cabinet:

1. Card removed.
2. Pulser did not pulse.
3. Slave cycler received go signal while in cycle.

Power Cabinet:

1. Phase failure.
2. Regulation failure.
3. Logic error.
4. Multiplexing error.
5. Card removed.
6. Reactor trip breaker open.
7. Loss of power to MG sets.

Probable Causes

1. Blown fuse or component failure.
2. Reactor trip breakers open.
3. Loss of power to MG sets.
4. Rod testing (e.g. 0-SI-OPS-085-011.0 or low power physics testing).
5. Misaligned / dropped rod recovery.

Corrective Actions

[1] **PLACE** rod control in manual.

CAUTION Attempting to reset rod control urgent failure alarm using M-4 pushbutton, [1-RCAS], prior to determining and correcting cause could result in dropped rods.

[2] **DISPATCH** MIG personnel to MG Set Room to investigate cause.

CORRECTIVE ACTIONS CONTINUED ON NEXT PAGE

Source	Setpoint	
SER 420 1-MS-30-241 (in lower Compt)	13.33 milliamps DC increasing (equal to 2.5°F/min. rate of temp increase)	**MS-30-241 LOWER COMPT MOISTURE HI**

Probable Causes

1. **RCS, steam line, feedwater line, ERCW, CCS or HPFP leak in containment.**
2. **MS-30-241 malfunction.**

Corrective Actions

[1] **CHECK** dew point temperature by observing 1-MR-30-240 on 1- M-10.

[2] MONITOR **containment pressure via 1-PDI-30-45, 44, 43, 42 on 1-M-6 for increase.**

[3] **IF** a small RCS leak is indicated, **THEN**
GO TO AOP-R.05, *RCS Leak and leak Source Identification*.

[4] **IF** in Mode 4 or Mode 5 and a LOCA is indicated, **THEN**
GO TO AOP-R.02, Shutdown LOCA (Mode 4, or 5).

[5] **IF** a leak other than an RCS or secondary leak is suspected, **THEN**
REFER to AOP-M.01, *Loss of Essential Raw Cooling Water* or AOP-M.03, *Loss of Component Cooling Water.*

[6] **IF** secondary system leak is suspected, **THEN**
GO TO **AOP-S.05, *Steam Line or Feedwater Line Break/Leak.***

References

45B655-05C-0
47B601-30-52
47W610-30-1

3. 009 EA2.10 003

Which ONE of the following changes in containment conditions discriminates between a small break LOCA and a steam line break inside containment in accordance with AOP-R.05, "RCS Leak and Leak Source Identification"?

A. ✓ Radiation

B. Humidity

C. Pressure

D. Temperature

DISTRACTOR ANALYSIS:

The 4 choices are the 4 parameters identified in the AOP to be used for the leak source determination.

A. CORRECT, Airborne radiation would be increasing with a small break LOCA but not with a steam line break.

B. Incorrect, Both a small break LOCA and a steam line break would cause containment humidity to increase. Plausible because containment humidity is one of the parameters identified in the AOP to be checked during performance of the step determining if it is the RCS or Steam line leaking into containment.

C. Incorrect, Both a small break LOCA and a steam line break would cause containment pressure to increase. Plausible because containment pressure is one of the parameters identified in the AOP to be checked during performance of the step determining if it is the RCS or Steam line leaking into containment.

D. Incorrect, Both a small break LOCA and a steam line break would cause containment temperature to increase. Plausible because containment temperature is one of the parameters identified in the AOP to be checked during performance of the step determining if it is the RCS or Steam line leaking into containment.

Question No. 3

Tier 1 Group 1

K/A 009 EA2.10
Ability to determine or interpret the following as they apply to a small break LOCA: Airborne activity

Importance Rating: 3.1 / 3.7

Technical Reference: AOP-R-05, RCS Leak and Leak Source Identification, Rev 12

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271AOP-R.05 B.7
Describe the conditions and reason for transitions within this procedure and transitions to other procedures.

Question Source:
Bank # __X_______
Modified Bank # __________
New _______

Question History: SRO question on Summer 2002 exam

Question Cognitive Level:
Memory or fundamental knowledge __X____
Comprehension or Analysis _______

10 CFR Part 55 Content: (43.5 / 45.13)

10CFR55.43.b (n/a)

Comments: Summer 2002 exam with minor wording modifications

..009EA2.10.1

9/17/2002

Summer Unit 1

Exam Level S

Mark Question | Print Recor | New Searc | Exit

Question

Which one of the following discriminates between a small break LOCA and a steam line break inside containment per EOP-1.0, Reactor Trip/Safety Injection Actuation?

Answer: Reactor building radiation

Distracter 1 Reactor building pressure

Distracter 2 Reactor building humidity

Distracter 3 Reactor building temperature

Distracter Analysis:

Answer:

Distracter A - Incorrect, both can cause pressure to increase.
Distracter B - Incorrect, both can cause humidity to increase.
Distracter C - Incorrect,both can cause temperature to increase.
Answer D - the RCS leakage will cause radiation levels to increase.

Distracter 1:

Distracter A - Incorrect, both can cause pressure to increase.
Distracter B - Incorrect, both can cause humidity to increase.
Distracter C - Incorrect,both can cause temperature to increase.
Answer D - the RCS leakage will cause radiation levels to increase.

Distracter 2:

Distracter A - Incorrect, both can cause pressure to increase.
Distracter B - Incorrect, both can cause humidity to increase.
Distracter C - Incorrect,both can cause temperature to increase.
Answer D - the RCS leakage will cause radiation levels to increase.

Distracter 3:

Distracter A - Incorrect, both can cause pressure to increase.
Distracter B - Incorrect, both can cause humidity to increase.
Distracter C - Incorrect,both can cause temperature to increase.
Answer D - the RCS leakage will cause radiation levels to increase.

I. PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: AOP-R.05 RCS LEAK AND LEAK SOURCE IDENTIFICATION

IV. LENGTH OF LESSON/COURSE: 1 hour(s)

V. TRAINING OBJECTIVES:

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate or explain, using classroom evaluations and/or simulator scenarios, the requirements of AOP -R.05, RCS LEAK AND LEAK SOURCE IDENTIFICATION.

B. Enabling Objectives:

0.	Demonstrate an understanding of NUREG 1122 Knowledge's and Abilities associated with Reactor Leak and Leak Source Identification that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate license position as identified in Appendix A.
1.	Explain the purpose/goal of AOP-R.05.
2.	Discuss the AOP-R.05 entry conditions. a. Describe the setpoints, interlocks, and automatic actions associated with AOP-R.05 entry conditions. b. Describe the ARP requirements associated with AOP-R.05 entry conditions. c. Interpret, prioritize, and verify associated alarms are consistent with AOP-R.05 entry conditions. d. Describe the Administrative conditions that require Turbine Trip/ Reactor trip due to RCS leakage.
3.	Describe the initial operator response to stabilize the plant upon entry into AOP-R.05.
4.	Upon entry into AOP-R.05, diagnose the applicable condition and transition to the appropriate procedural section for response.
5.	Summarize the mitigating strategy for the failure that initiated entry into AOP-R.05.
6.	Describe the bases for all limits, notes, cautions, and steps of AOP-R.05.
7.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.

8.	Given a set of initial plant conditions use AOP-R.05 to correctly: a. Recognize entry conditions b. Identify required actions c. Respond to Contingencies d. Observe and Interpret Cautions and Notes
9.	Describe the Tech Spec and TRM actions applicable during the performance of AOP-R.05.
10.	Apply GFE and system response concepts to the abnormal condition – prior to, during and after the abnormal condition

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2.1 Small Reactor Coolant System Leak (cont'd)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7.	**CHECK** secondary side radiation NORMAL: • S/G blowdown rad monitor • Condenser vacuum exhaust rad monitor • Main steam line rad monitors.	**GO TO** AOP-R.01, Steam Generator Tube Leak.
8.	**CHECK** containment airborne activity RISING. (RM-90-106 or 112)	**IF** Unit is in Mode 1-4 **AND** containment pressure, temperature or humidity are RISING ABNORMALLY, **THEN** **GO TO** AOP-S.05, Steamline or Feedwater Line Break/Leak. **IF** containment parameters are normal, **THEN** **GO TO** Step 10.

4. 015 AA2.08 004

Which ONE of the following identifies the LOWEST temperature on the Reactor Coolant Pump lower bearing, that if exceeded would require tripping the #1 RCP, in accordance with AOP-R.04, "Reactor Coolant Pump Malfunction"?

A. 170°F

B. 179°F

C. 200°F

D✓ 225°F

<u>DISTRACTOR ANALYSIS</u>:

A. Incorrect, AOP-R.04 identifies RCP Lower Bearing Temperature greater than 225°F as requiring a trip of the RCP. Plausible because 170°F is the temperature that causes the RCP lower bearing temperature high alarm.

B. Incorrect, AOP-R.04 identifies RCP Lower Bearing Temperature greater than 225°F as requiring a trip of the RCP. Plausible because 179°F is the temperature that causes the RCP seal water temperature high alarm.

C. Incorrect, AOP-R.04 identifies RCP Lower Bearing Temperature greater than 225°F as requiring a trip of the RCP. Plausible because exceeding 200°F on the RCP Upper or Lower Motor Bearing would require a trip of the RCP as identified in AOP-R.04 .

D. CORRECT, AOP-R.04 identifies RCP Lower Bearing Temperature greater than 225°F as requiring a trip of the RCP.

Question No. 4

Tier 1 Group 1

K/A 015 AA2.08
Ability to determine and interpret the following as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): When to secure RCPs on high bearing temperature.

Importance Rating: 3.4 / 3.5

Technical Reference: AOP-R.04, Reactor Coolant Pump Malfunctions, Rev 23
1-AR-M5-B, CVCS Seal Water and RCP, Rev 36

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271AOP-R.04 B.8.b
Given a set of plant conditions use AOP-R.04 to correctly:
b. Identify required actions

Question Source:
Bank # __________
Modified Bank # ___X______
New ________

Question History: SQN Bank question AOP-R.04-B.6 009 modified

Question Cognitive Level:
Memory or fundamental knowledge _X______
Comprehension or Analysis _______

10 CFR Part 55 Content: (43.5 / 45.13)

10CFR55.43.b (n/a)

Comments: Modified Question AOP-R.04-B.6 009

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2.0 OPERATOR ACTIONS

CAUTION: Exceeding the following limitations requires trip of the affected RCP, unless RCP operation is required by FR-C.1, *Inadequate Core Cooling* or FR-C.2, *Degraded Core Cooling*:

- **RCP #1 Seal ΔP less than 220 psid**
- **RCP #1 Seal Temperature greater than 225°F**
- **RCP Lower Bearing Temperature greater than 225°F**
- **RCP Upper Motor Bearing Temperature greater than 200°F**
- **RCP Lower Motor Bearing Temperature greater than 200°F**
- **RCP Motor Voltage less than 5940V or greater than 7260V**
- **RCP Motor Amps greater than 608 amps**
- **RCP Vibration greater than 20 mils on any axis (x and/or y) [C.3]**

NOTE 1: During plant startup following seal maintenance, the seal package should seat and operate normally following 24 hours of run time.

NOTE 2: RCP trip criteria is also located in Appendix B. This appendix should be referred to throughout the performance of this procedure.

1. **DIAGNOSE** the failure:

IF...	GO TO SECTION	PAGE
Reactor Coolant Pump(s) tripped or shutdown required	2.1	4
RCP #1 Seal Leakoff high flow (high flow Alarm)	2.2	7
RCP #1 Seal Leakoff low flow (low flow Alarm)	2.3	13
RCP #2 Seal Leakoff high flow (high RCP standpipe level)	2.4	18
RCP #3 Seal Leakoff high flow (low RCP standpipe level)	2.5	21
RCP Motor Stator Temperature High	2.6	24

Source		Setpoint
SER 2150		
1. TS-62-3	Pump 1	170°F increasing
SER 2149		
2. TS-62-16	Pump 2	
SER 2138		
3. TS-62-29	Pump 3	
SER 2137		
4. TS-62-42	Pump 4	

TS-62-42
REAC COOL PMPS LOWER BEARING TEMP HIGH

Probable Causes

1. Seal injection water high temperature.
2. Loss of seal injection water with insufficient cooling water to thermal barrier.
3. Low system pressure with insufficient pump seal/bearing water flow.

Corrective Actions

[1] **CHECK** lower bearing temperature on 1-M-5.

RCP	Instrument ID
1	1-TI-62-3
2	1-TI-62-16
3	1-TI-62-29
4	1-TI-62-42

NOTE

Lower bearing temperature can increase with loss of seal injection water supply along with low seal leak off flows even with normal thermal barrier cooling flows. (NSAL-99-005)

[2] **IF** loss of seal injection water supply, **THEN**
REFER TO corrective actions for window **C-3,** this Instruction.

[3] **IF** lower pump bearing temperature high is a valid alarm, **THEN**
REFER TO AOP-R.04, *Reactor Coolant Pump Malfunctions.*

[4] **IF** lower pump bearing temperature approaches 225°F, **THEN**
GO TO AOP-R.04, *Reactor Coolant Pump Malfunctions.*

[5] **REFER TO** 1-SO-68-2 for RCP operating limits.

References

45B655-05B-0, 47B601-62-8, 47W610-62-1
Westinghouse Nuclear Safety Advisory Letter (NSAL-99-005)

Source		Setpoint	
SER 2154			**TS-62-43 REAC COOL PMPS SEAL WATER TEMP HI**
1. TS-62-4	Pump 1	179°F increasing	
SER 2153			
2. TS-62-17	Pump 2		
SER 2152			
3. TS-62-30	Pump 3		
SER 2151			
4. TS-62-43	Pump 4		

Probable Causes

1. Seal injection high temperature.
2. Loss of seal injection water with insufficient cooling water to thermal barrier.
3. Low system pressure with insufficient pump seal water flow.

Corrective Actions

[1] **DETERMINE** which pump has brought in the alarm by observing the TI's on 1-M-5.

RCP	Instrument ID
1	1-TI-62-4
2	1-TI-62-17
3	1-TI-62-30
4	1-TI-62-43

NOTE

Lower bearing temperature can increase with loss of seal injection water supply along with low seal leak off flows even with normal thermal barrier cooling flows. (NSAL-99-005)

[2] **IF** loss of seal injection water supply, **THEN**
REFER TO corrective actions for window **C-3,** this Instruction.

[3] **IF** "Reac Cool Pmps Seal Leakoff High Flow" alarm is also lit, **THEN**
GO TO AOP-R.04, *Reactor Coolant Pump Malfunctions.*

[4] **IF** No. 1 seal or bearing temperature approaches 225°F, **THEN**
GO TO AOP-R.04, *Reactor Coolant Pump Malfunctions.*

[5] **IF** unit heatup in progress, **THEN**
REFER TO 1-SO-62-1, Chemical and Volume Control System, regarding No. 1 seal bypass valve operation.

References

45B655-05B-0, 47B601-62-8, 47W610-62-1
Westinghouse Nuclear Safety Advisory Letter (NSAL-99-005)

FS-62-11
REAC COOL PMPS
SEAL LEAKOFF
HIGH FLOW

Source	**Setpoint**
SER 2127	
1. FS-62-11 Pump 1	4.8 gpm increasing
SER 2126	
2. FS-62-24 Pump 2	4.8 gpm increasing
SER 2125	
3. FS-62-37 Pump 3	4.8 gpm increasing
SER 2124	
4. FS-62-50 Pump 4	4.8 gpm increasing

Probable Causes

1. High seal water supply temperature.
2. No. 1 seal damage.
3. High temperature of the injection water supply.

Corrective Actions

[1] **VERIFY** High Leakoff flow condition on affected RCP(s) with the following instruments.

Pump	Leakoff Instrumentation
RCP 1	1-FR-62-24
RCP 2	1-FR-62-24
RCP 3	1-FR-62-50
RCP 4	1-FR-62-50

[2] **GO TO** AOP-R.04, *Reactor Coolant Pump Malfunctions.*

References

45B655-05B-0, 47B601-62-3, 47W610-68-1

AOP-R.04-B.6 009

The following conditions are observed:

- Reactor power = 73%
- RCP LWR BEARING TEMP HI alarm
- RCP #1 SEAL OUTLET TEMP HI alarm
- RCP SEAL LEAK OFF FLOW HI alarm

Which ONE (1) of the following conditions would require tripping the reactor and stopping #1 RCP?

A. #1 Seal Outlet temperature exceeds 210°F.

B.✓ Lower bearing temperature exceeds 225°F.

C. #1 Seal Leakoff Flow exceeds 6 gpm.

D. #1 Seal differential pressure decreases to 230 psid.

The correct answer is B

I. PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: AOP-R.04, REACTOR COOLANT PUMP MALFUNCTIONS

IV. LENGTH OF LESSON/COURSE: 2 hours

V. TRAINING OBJECTIVES:

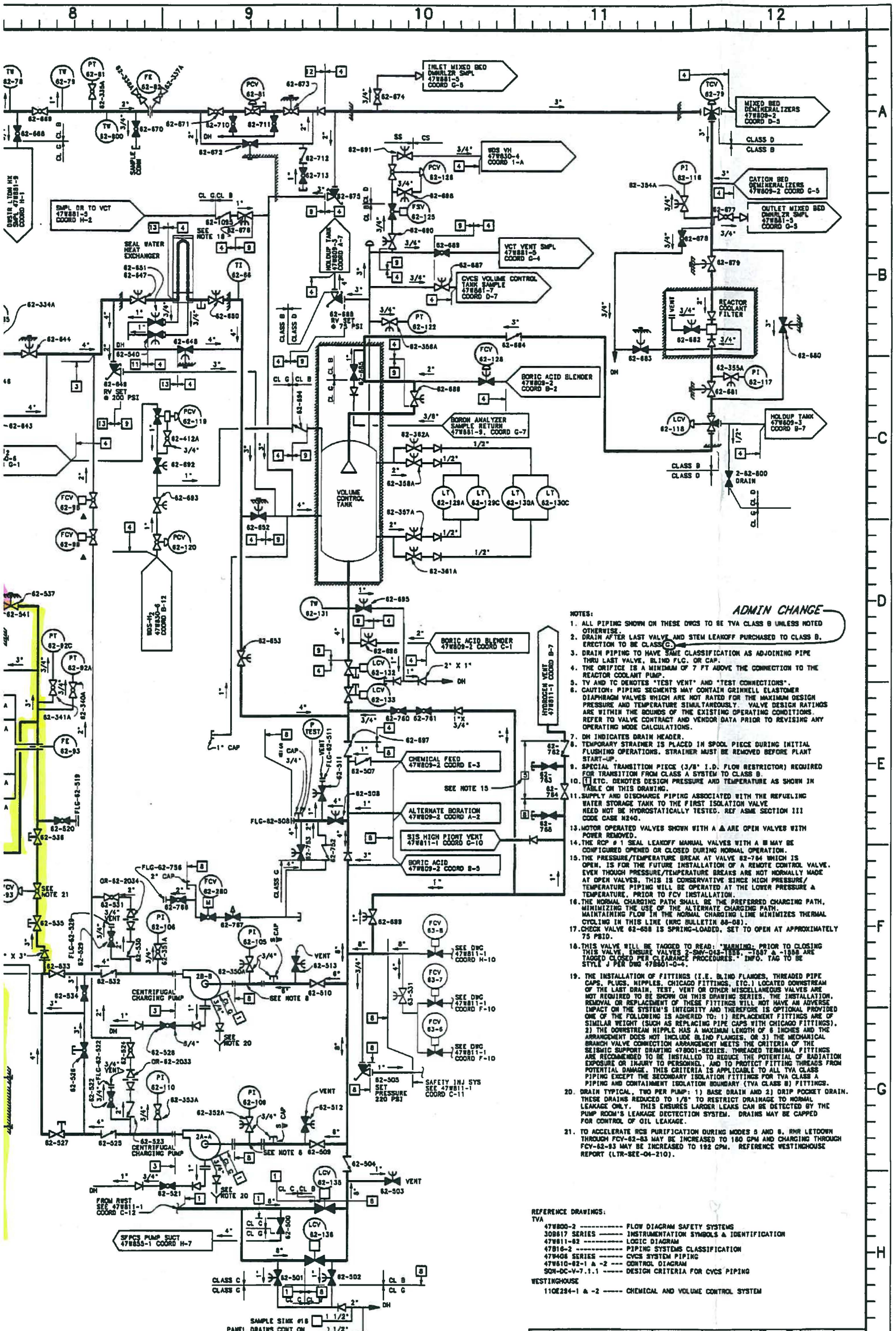
A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate or explain, using classroom evaluations and/or simulator scenarios, the requirements of AOP-R.04, Reactor Coolant Pump Malfunctions.

B. Enabling Objectives:

0.	Demonstrate an understanding of NUREG 1122 Knowledge's and Abilities associated with , Reactor Coolant Pump Malfunctions that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate license position as identified in Appendix A.
1.	Explain the purpose/goal of AOP-R.04.
2.	Discuss the AOP-R.04 entry conditions. a. Describe the setpoints, interlocks, and automatic actions associated with AOP-R.04 entry conditions. b. Describe the ARP requirements associated with AOP-R.04 entry conditions. c. Interpret, prioritize, and verify associated alarms are consistent with AOP-R.04 entry conditions. d. Describe the Administrative conditions that require Turbine Trip/ Reactor trip due to Reactor Coolant Pump Malfunctions.
3.	Describe the initial operator response to stabilize the plant upon entry into AOP-R.04.
4.	Upon entry into AOP-R.04, diagnose the applicable condition and transition to the appropriate procedural section for response.
5.	Summarize the mitigating strategy for the failure that initiated entry into AOP-R.04.
6.	Describe the bases for all limits, notes, cautions, and steps of AOP-R.04.
7.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.

8.	Given a set of initial plant conditions use AOP-R.04 to correctly: a. Recognize entry conditions b. Identify required actions c. Respond to Contingencies d. Observe and Interpret Cautions and Notes
9.	Describe the Tech Spec and TRM actions applicable during the performance of AOP-R.04.
10.	Apply GFE and system response concepts to the abnormal condition – prior to, during and after the abnormal condition



NOTES:

ADMIN CHANGE

1. ALL PIPING SHOWN ON THESE DWGS TO BE TVA CLASS B UNLESS NOTED OTHERWISE.
2. DRAIN AFTER LAST VALVE AND STEM LEAKOFF PURCHASED TO CLASS B. ERECTION TO BE CLASS C.
3. DRAIN PIPING TO HAVE SAME CLASSIFICATION AS ADJOINING PIPE THRU LAST VALVE, BLIND FLG. OR CAP.
4. THE ORIFICE IS A MINIMUM OF 7 FT ABOVE THE CONNECTION TO THE REACTOR COOLANT PUMP.
5. TV AND TC DENOTES "TEST VENT" AND "TEST CONNECTIONS".
6. CAUTION: PIPING SEGMENTS MAY CONTAIN GRINNELL ELASTOMER DIAPHRAGM VALVES WHICH ARE NOT RATED FOR THE MAXIMUM DESIGN PRESSURE AND TEMPERATURE SIMULTANEOUSLY. VALVE DESIGN RATINGS ARE WITHIN THE BOUNDS OF THE EXISTING OPERATING CONDITIONS. REFER TO VALVE CONTRACT AND VENDOR DATA PRIOR TO REVISING ANY OPERATING MODE CALCULATIONS.
7. DH INDICATES DRAIN HEADER.
8. TEMPORARY STRAINER IS PLACED IN SPOOL PIECE DURING INITIAL FLUSHING OPERATIONS. STRAINER MUST BE REMOVED BEFORE PLANT START-UP.
9. SPECIAL TRANSITION PIECE (3/8" I.D. FLOW RESTRICTOR) REQUIRED FOR TRANSITION FROM CLASS A SYSTEM TO CLASS B.
10. $\boxed{1}$ ETC. DENOTES DESIGN PRESSURE AND TEMPERATURE AS SHOWN IN TABLE ON THIS DRAWING.
11. SUPPLY AND DISCHARGE PIPING ASSOCIATED WITH THE REFUELING WATER STORAGE TANK TO THE FIRST ISOLATION VALVE NEED NOT BE HYDROSTATICALLY TESTED. REF ASME SECTION III CODE CASE N240.
13. MOTOR OPERATED VALVES SHOWN WITH A ▲ ARE OPEN VALVES WITH POWER REMOVED.
14. THE RCP # 1 SEAL LEAKOFF MANUAL VALVES WITH A ■ MAY BE CONFIGURED OPENED OR CLOSED DURING NORMAL OPERATION.
15. THE PRESSURE/TEMPERATURE BREAK AT VALVE 62-764 WHICH IS OPEN, IS FOR THE FUTURE INSTALLATION OF A REMOTE CONTROL VALVE. EVEN THOUGH PRESSURE/TEMPERATURE BREAKS ARE NOT NORMALLY MADE AT OPEN VALVES, THIS IS CONSERVATIVE SINCE HIGH PRESSURE/ TEMPERATURE PIPING WILL BE OPERATED AT THE LOWER PRESSURE & TEMPERATURE, PRIOR TO FCV INSTALLATION.
16. THE NORMAL CHARGING PATH SHALL BE THE PREFERRED CHARGING PATH, MINIMIZING THE USE OF THE ALTERNATE CHARGING PATH. MAINTAINING FLOW IN THE NORMAL CHARGING LINE MINIMIZES THERMAL CYCLING IN THIS LINE (NRC BULLETIN 88-08).
17. CHECK VALVE 62-658 IS SPRING-LOADED, SET TO OPEN AT APPROXIMATELY 75 PSID.
18. THIS VALVE WILL BE TAGGED TO READ: "WARNING: PRIOR TO CLOSING THIS VALVE, ENSURE VALVES 2-SMV-043-1886, -1887 & -1888 ARE TAGGED CLOSED PER CLEARANCE PROCEDURES." INFO. TAG TO BE STYLE J PER DWG 47B601-0-4.
19. THE INSTALLATION OF FITTINGS (I.E. BLIND FLANGES, THREADED PIPE CAPS, PLUGS, NIPPLES, CHICAGO FITTINGS, ETC.) LOCATED DOWNSTREAM OF THE LAST DRAIN, TEST, VENT OR OTHER MISCELLANEOUS VALVES ARE NOT REQUIRED TO BE SHOWN ON THIS DRAWING SERIES. THE INSTALLATION, REMOVAL OR REPLACEMENT OF THESE FITTINGS WILL NOT HAVE AN ADVERSE IMPACT ON THE SYSTEM'S INTEGRITY AND THEREFORE IS OPTIONAL PROVIDED ONE OF THE FOLLOWING IS ADHERED TO: 1) REPLACEMENT FITTINGS ARE OF SIMILAR WEIGHT (SUCH AS REPLACING PIPE CAPS WITH CHICAGO FITTINGS). 2) THE DOWNSTREAM NIPPLE HAS A MAXIMUM LENGTH OF 6 INCHES AND THE ARRANGEMENT DOES NOT INCLUDE BLIND FLANGES, OR 3) THE MECHANICAL BRANCH VALVE CONNECTION ARRANGEMENT MEETS THE CRITERIA OF THE SEISMIC SUPPORT DRAWING 47B001-SERIES. THREADED TERMINAL FITTINGS ARE RECOMMENDED TO BE INSTALLED TO REDUCE THE POTENTIAL OF RADIATION EXPOSURE OR INJURY TO PERSONNEL, AND TO PROTECT FITTING THREADS FROM POTENTIAL DAMAGE. THIS CRITERIA IS APPLICABLE TO ALL TVA CLASS PIPING EXCEPT THE SECONDARY ISOLATION FITTINGS FOR TVA CLASS A PIPING AND CONTAINMENT ISOLATION BOUNDARY (TVA CLASS B) FITTINGS.
20. DRAIN TYPICAL, TWO PER PUMP: 1) BASE DRAIN AND 2) DRIP POCKET DRAIN. THESE DRAINS REDUCED TO 1/8" TO RESTRICT DRAINAGE TO NORMAL LEAKAGE ONLY. THIS ENSURES LARGER LEAKS CAN BE DETECTED BY THE PUMP ROOM'S LEAKAGE DECTECTION SYSTEM. DRAINS MAY BE CAPPED FOR CONTROL OF OIL LEAKAGE.
21. TO ACCELERATE RCS PURIFICATION DURING MODES 5 AND 6, RHR LETDOWN THROUGH FCV-62-83 MAY BE INCREASED TO 180 GPM AND CHARGING THROUGH FCV-62-93 MAY BE INCREASED TO 192 GPM. REFERENCE WESTINGHOUSE REPORT (LTR-SEE-04-210).

REFERENCE DRAWINGS:
TVA
47W800-2 ----------- FLOW DIAGRAM SAFETY SYSTEMS
30B617 SERIES ------ INSTRUMENTATION SYMBOLS & IDENTIFICATION
47W611-62 ---------- LOGIC DIAGRAM
47B16-2 ------------ PIPING SYSTEMS CLASSIFICATION
47W406 SERIES ------ CVCS SYSTEM PIPING
47W610-62-1 & -2 --- CONTROL DIAGRAM
SQN-DC-V-7.1.1 ----- DESIGN CRITERIA FOR CVCS PIPING
WESTINGHOUSE
110E234-1 & -2 ----- CHEMICAL AND VOLUME CONTROL SYSTEM

REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
71	ADMIN CHANGE	DGR	JLG	BMB	5/1/07

INC: ADMIN CHANGE PER RIMS: B85 070430 001
THIS RESOLVES PER 113324

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE
UNIT 2
CATEGORY 1

FLOW DIAGRAM CHEMICAL & VOLUME CONTROL SYSTEM

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY

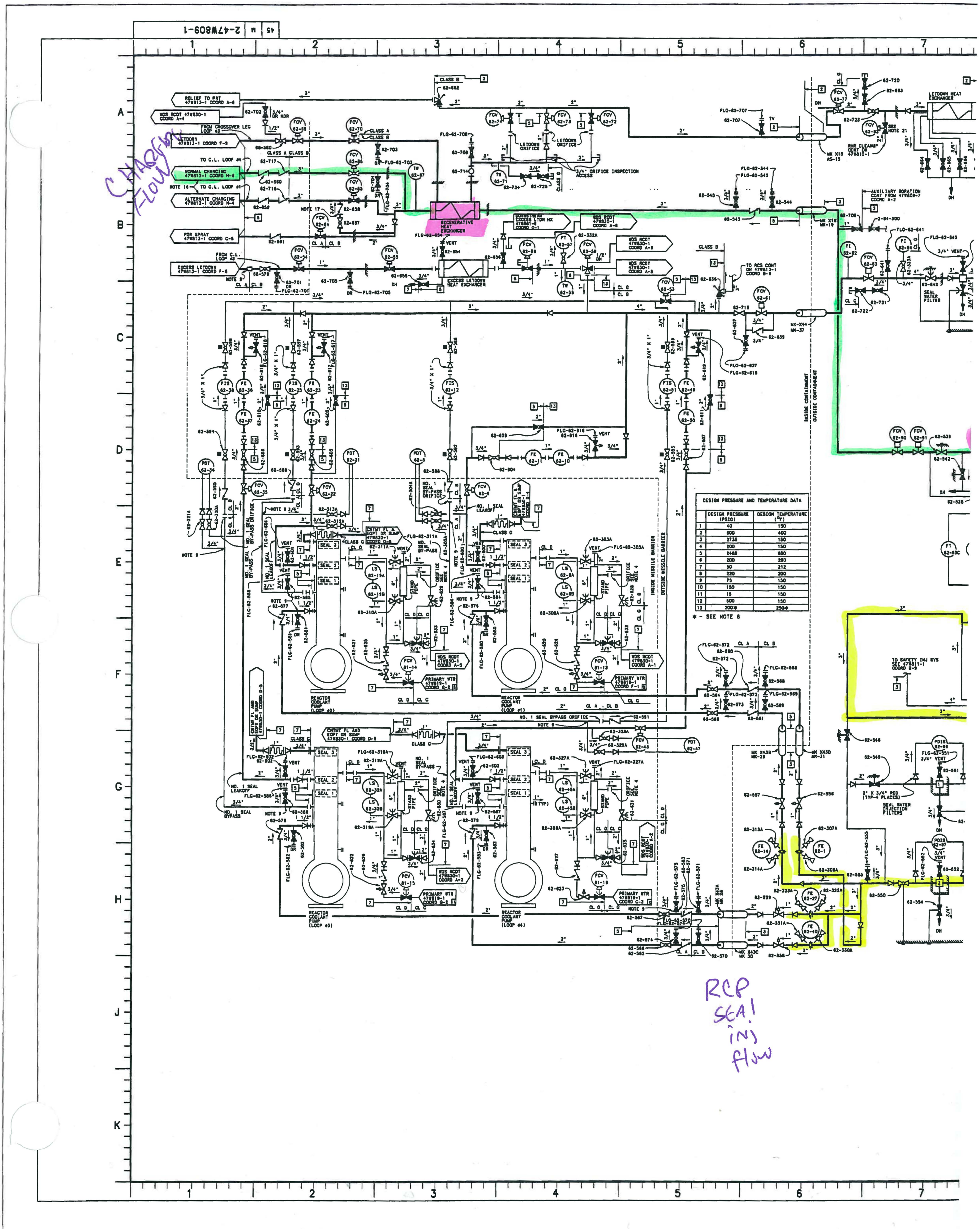
INITIAL ISSUE	ENGINEERING APPROVAL
RO ISSUE PER: CCD RECONCILIATION SHEET NO. CCD-10570. SPLIT DRAWING PER ATTACH. E. DRAWING MADE FROM 1,2-47W809-1 R12.	1 SEE RO
	2 SEE RO
	3 SEE RO

CCD	ISSUE DATE 5-21-90	45	M	2-47W809-1	R71

CAD MAINTAINED DRAWING

CONTROL ROOM DWG

pull



	DESIGN PRESSURE (PSIG)	DESIGN TEMPERATURE (°F)
1	40	150
2	600	400
3	2735	150
4	200	180
5	2485	650
6	200	200
7	80	212
8	220	200
9	75	150
10	150	150
11	15	150
12	600	150
13	200*	250*

Table: DESIGN PRESSURE AND TEMPERATURE DATA

* - SEE NOTE 6

000022 AK1.02	12/09/2004
Indian Point Unit 2	Exam Level R

Mark Question | Print Recor | New Search | Exit

Question

The position of HCV-142, Charging Line Flow Control Valve, is changed to vary RCP seal injection flow. IF HCV-142 is closed slightly, THEN:

Charging Pump Discharge Press	RCP Seal Injection Flow	Charging Flow to Regen Hx

Answer: A. Increases Increases Decreases

Distracter 1 B. Increases Decreases Increases

Distracter 2 C. Decreases Increases Decreases

Distracter 3 D. Decreases Decreases Increase

Distracter Analysis:

Answer:

Distracter 1:

Distracter 2:

Distracter 3:

..022.AK1.02	09/01/2003
Prairie Island Unit 1	**Exam Level** R

Mark Question | Print Record | New Search | Exit

Question

The position of CV-31158, Charging Line Flow Control, is changed to vary RCP seal injection flow. IF CV-31158 is closed slightly, THEN
Charging Pump Header Pressure RCP Seal Water Injection Flow Charging Flow to Regen HX

	Charging Pump Header Pressure	RCP Seal Water Injection Flow	Charging Flow to Regen HX
Answer:	Increases	Increases	Decreases
Distracter 1	Increases	Decreases	Increases
Distracter 2	Decreases	Increases	Decreases
Distracter 3	Decreases	Decreases	Increases

Distracter Analysis:

Answer:

Distracter 1:

Distracter 2:

Distracter 3:

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** REACTOR COOLANT PUMP SYSTEM

IV. **LENGTH OF LESSON:** 4 hour lecture; 2 hour simulator demonstration; 2 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Reactor Coolant Pump system in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with the Reactor Coolant Pump System that are rated $\geq$ 2.5 during Initial License training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the Reactor Coolant Pump System as described in the SQN FSAR.
2. State the design basis of the Reactor Coolant Pump System in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the Reactor Coolant Pump System as illustrated on the simplified system drawing.
4. Describe the following items for each major component in the Reactor Coolant Pump System as described in this lesson:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the Reactor Coolant Pump System components are designed
   m. Location of controls and indications associated with the Reactor Coolant Pump System in the control room and auxiliary control room

V. TRAINING OBJECTIVES (Cont'd):

B. Enabling Objectives (Cont'd):

5. Describe the operation of the RCP system as it relates to the following:
   a. Precautions and limitations
   b. Major steps performed while placing the RCP system in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect RCP system operation
   f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the RCP system as explained in this lesson:
   a. State Tech Specs/TRM LCOs that govern the RCPs
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the RCP system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events:
   a. SQ961761PER; RCP#4 above 15mil vibration alarm
   b. SOER-82-5; Reactor Coolant Pump seal failure
   c. SER 20-86; RCP shaft failure at Crystal River

VI. TRAINING AIDS:

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)

6. 025 AG2.2.36 006

Given the following:

- Unit 1 has been shutdown and a cooldown is in progress.
- Tavg is currently 220°F.
- Current RCP status is:

#1	#2	#3	#4
Off but available	Running	Off & tagged	Off & tagged

- All S/G levels are between 28 - 34% narrow range.
- The operating crew is in the process of placing the unit on RHR cooling using Train "B".
- During relay testing on 6.9kV Shutdown board 1A-A a differential relay is actuated.

Which ONE of the following identifies the status of Technical Specification 3.4.1.3, "Reactor Coolant System - Shutdown" if RHR Pump 1B-B trips when a start is attempted?

A.✓ LCO entry is NOT required, the Technical Specification is met.

B. LCO would be entered until RCP #1 was placed in service.

C. LCO would be entered until one RHR pump was restored to service.

D. LCO would be entered until either both RHR pumps were returned to operable status or the RCS was cooled to less than 200°F

DISTRACTOR ANALYSIS:

A. *CORRECT, The LCO requires that 2 of the listed loops be operable and at least one in operation. Six loops are listed - the 4 RCS loops and the 2 RHR loops. Conditions identify both RHR loops are not operable, the RCS loops 1 and 2 are operable and loop 2 is in service. Therefore no entry into this LCO is required.*

B. *Incorrect, The T/S is met with the 2 RCS loops operable, no entry into this LCO is required. Plausible because the T/S requires 2 loops to be in operation in Mode 3 and starting RCP #1 would result in 2 loops in operation. Also, because with neither RHR loop operable in Mode 5, the LCO entry would be required.*

C. *Incorrect, The T/S is met with the 2 RCS loops operable, no entry into this LCO is required. Plausible because the T/S requires both RHR loops operable with one RHR loop in service if the unit was in Mode 5.*

D. *Incorrect, The T/S is met with the 2 RCS loops operable, no entry into this LCO is required. Plausible because the T/S requires both RHR pumps to be operable in Mode 5. Also, in Mode 5, two loops filled and with SGs above 10% wide range can be used to replace one RHR loop.*

Question No. 6

Tier 1 Group 1

K/A 025 AG2.2.36
Loss of Residual Heat Removal System
Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.

Importance Rating: 3.1 / 4.2

Technical Reference: Technical Specification Reactor Coolant System 3.4.1
Amendment 285

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271AOP-R.03 B. 9
Describe the Tech Spec and TRM actions applicable during performance of AOP-R.03

Question Source:
Bank # __________
Modified Bank # __________
New _X_____

Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge _______
Comprehension or Analysis __X____

10 CFR Part 55 Content: (41.10 / 43.2 / 45.13)

10CFR55.43.b (n/a)

Comments: New question for SQN 1/2009 exam

LIMITING CONDITION FOR OPERATION

3.4.1.3 a. At least two of the reactor coolant and/or residual heat removal (RHR) loops listed below shall be OPERABLE:

1. Reactor Coolant Loop A and its associated steam generator and reactor coolant pump,*
2. Reactor Coolant Loop B and its associated steam generator and reactor coolant pump,*
3. Reactor Coolant Loop C and its associated steam generator and reactor coolant pump,*
4. Reactor Coolant Loop D and its associated steam generator and reactor coolant pump,*
5. Residual Heat Removal Loop A,
6. Residual Heat Removal Loop B.

b. At least one of the above reactor coolant and/or RHR loops shall be in operation.**

APPLICABILITY: MODE 4.

ACTION:

a. With less than the above required loops OPERABLE, immediately initiate corrective action to return the required loops to OPERABLE status as soon as possible; be in COLD SHUTDOWN within 20 hours.

b. With no reactor coolant or RHR loop in operation, suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet SDM of LCO 3.1.1.1 and immediately initiate corrective action to return the required coolant loop to operation.

**All reactor coolant pumps and residual heat removal pumps may be de-energized for up to 1 hour provided 1) no operations are permitted that would cause introduction of coolant into the RCS with boron concentration less than required to meet SDM of LCO 3.1.1.1, and 2) core outlet temperature is maintained at least 10°F below saturation temperature.

*A reactor coolant pump shall not be restarted unless a steam bubble exists in the pressurizer.

SURVEILLANCE REQUIREMENTS

4.4.1.3.1 The required reactor coolant pump(s), if not in operation, shall be determined to be OPERABLE once per 7 days by verifying correct breaker alignments and indicated power availability.

4.4.1.3.2 The required steam generator(s) shall be determined OPERABLE by verifying secondary side water level to be greater than or equal to 10 percent (wide-range indication) at least once per 12 hours.

4.4.1.3.3 At least one reactor coolant or RHR loop shall be verified to be in operation and circulating reactor coolant at least once per 12 hours.

I. PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: AOP-R.03, RHR SYSTEM MALFUNCTION

IV. LENGTH OF LESSON/COURSE: 2 hours

V. TRAINING OBJECTIVES:

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate or explain, using classroom evaluations and/or simulator scenarios, the requirements of AOP-R.03, RHR SYSTEM MALFUNCTION.

B. Enabling Objectives

	Objectives
0.	Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with RHR SYSTEM MALFUNCTIONs that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate position as identified in Appendix A.
1.	State the purpose/goal of this AOP-R.03.
2.	Describe the AOP-R.03 entry conditions.
	a. Describe the setpoints, interlocks, and automatic actions associated with AOP-R.03 entry conditions.
	b. Describe the ARP requirements associated with AOP-R.03 entry conditions.
	c. Interpret, prioritize, and verify associated alarms are consistent with AOP-R.03 entry conditions.
	d. Describe the plant parameters that may indicate an RHR System Malfunction.
3.	Describe the initial operator response to stabilize the plant upon entry into AOP-R.03.
4.	Upon entry into AOP-R.03, diagnose the applicable condition and transition to the appropriate procedural section for response.
5.	Summarize the mitigating strategy for the failure that initiated entry into AOP-R.03.
6.	Describe the bases for all limits, notes, cautions, and steps of AOP-R.03.

7.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.
8.	Given a set of initial plant conditions use AOP-R.03 to correctly:
	a. Recognize entry conditions.
	b. Identify required actions.
	c. Respond to Contingencies.
	d. Observe and Interpret Cautions and Notes.
9.	Describe the Tech Spec and TRM actions applicable during the performance of AOP-R.03.
10.	Apply GFE and system response concepts to the abnormal condition – prior to, during and after the abnormal condition.

7. 026 AA2.03 007
Given the following:

- Both Units are at 100% RTP.
- 1A-A Containment Spray Pump is tagged for maintenance.
- Unit 2 CCS is supplying the Spent Fuel Pool Cooling System.
- The C-S CCS Pump suffers a catastrophic bearing failure.
- The crew enters AOP-M.03, "Loss Of Component Cooling Water".

Which ONE of the following identifies the Containment Spray Pump(s) to be locked out and the compensatory alignment required prior to restoring the pumps?

	Containment Spray Pump(s) Locked Out	**Compensatory Alignment Required**
A.	2B-B only	Realign 2B-B CCS Pump for "B" Train cooling.
B.	1B-B and 2B-B	Realign 2B-B CCS Pump for "B" Train cooling.
C.	2B-B only	Realign 1B-B CCS Pump for "B" Train cooling.
D.✓	1B-B and 2B-B	Realign 1B-B CCS Pump for "B" Train cooling.

DISTRACTOR ANALYSIS:

A. *Incorrect. AOP-M.03, Section 2.1 requires the Stop and Lock Out of the Train B CSPs on both units to protect the pumps from the loss of cooling. With Unit 2 supplying SFP cooling, the 2B-B CCS pump would not be the pump realigned to Train B CCS. Plausible because locking out CSP 1B-B would place the Unit in an LCO 3.0.3 condition and the 2B-B CCS pump would be realigned if Unit 1 had been supplying SFP cooling.*

B. *Incorrect. AOP-M.03, Section 2.1 requires the Stop and Lock Out of the Train B CSPs on both units to protect the pumps from the loss of cooling. With Unit 2 supplying SFP cooling, the 1B-B CCS pump would be the pump realigned to Train B CCS. Plausible because locking out the CSP on both Units is required and the 2B-B CCS pump would be realigned if Unit 1 had been supplying SFP cooling.*

C. *Incorrect. AOP-M.03, Section 2.1 requires the Stop and Lock Out of the Train B CSPs on both units to protect the pumps from the loss of cooling. With Unit 2 supplying SFP cooling, the 1B-B CCS pump is realigned to Train B CSS. Plausible because locking out CSP 1B-B would place the Unit in an LCO 3.0.3 condition and realigning the 1B-B CCS pump is correct.*

D. *CORRECT, AOP-M.03, Section 2.1 requires the Stop and Lock Out of the Train B CSPs on both units to protect the pumps from the loss of cooling. The procedure then verifies which Unit is supplying the SFP cooling and aligns the opposite Unit's Train B CCS pump to supply the B Train for both units. The CSPs are then restored to A-Auto.*

Question No. 7

Tier 1 Group 1

K/A 026AA2.03
Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: The valve lineups necessary to restart the CCWS while bypassing the portion of the system causing the abnormal condition .

Importance Rating: 2.6 / 2.9

Technical Reference: AOP-M.03, Loss of Component Cooling Water, Rev 11
Section 2.1

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271AOP-M.03 B.5
Summarize the mitigating strategy for the condition that initiated entry into AOP-M.03

Question Source:
Bank # __________
Modified Bank # _X________
New ________

Question History: SQN bank question AOP-M.03-B.3 001 modified.

Question Cognitive Level:
Memory or fundamental knowledge ________
Comprehension or Analysis _X____

10 CFR Part 55 Content: (43.5 / 45.13)

10CFR55.43.b (n/a)

Comments: SQN bank question AOP-M.03-B.3 001 modified.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2.1 CCS Pump Failure

3. **STOP** and **LOCK OUT** the following B Train equipment:

   - Failed CCS Pump aligned to B Train (C-S, 1B-B, or 2B-B)
   - 1B-B Containment Spray Pump
   - 2B-B Containment Spray Pump

4. **CHECK** all Train A CCS pumps available.

   RNO: **EVALUATE** available CCS pumps and CCS plant needs to determine alignment requirements.

5. **CHECK** SFP Heat Exchanger CCS aligned to Unit 1:

   - 0-FCV-70-197, OPEN
   - 0-FCV-70-198, OPEN

   NO

   RNO: **ALIGN** 1B-B CCS Pump to B Train **USING** 0-SO-70-1, Component Cooling Water System "B" Train.

   WHEN alignment complete,
   THEN
   GO TO Step 7.

6. **ALIGN** 2B-B CCS Pump to B Train **USING** 0-SO-70-1, Component Cooling Water System "B" Train.

   WHEN alignment complete,
   THEN
   CONTINUE with this procedure.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2.1 CCS Pump Failure (cont'd)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7.	**CHECK** 0B1/0B2 CCS Heat Exchanger inlet pressure NORMAL for present plant conditions [0-PI-70-399]: • Between 90 psig and 118 psig	**GO TO** Section 2.4, Train B CCS Header Failure.
8.	**RESTORE** Train B Containment Spray Pumps to A-AUTO: • 1B-B Containment Spray Pump • 2B-B Containment Spray Pump	
9.	**GO TO** appropriate plant procedure.	
10.	**IDENTIFY** and **LOCK OUT** failed CCS Pump.	

AOP-M.03-B.3 001

The following plant conditions exist on Units 1 and 2:

- Unit 1 is at 100% RTP.
- 1 B-B Containment Spray Pump is tagged for maintenance.
- Unit 1 CCS is supplying the Spent Fuel Pool Cooling System.
- C-S CCS pump suffers catastrophic bearing failure.

Which ONE of the following describes the effect of this failure and compensatory measures (if any) required for Unit 1?

	Effect	**Compensatory Measures**
A.	1B-B and 2B-B CCS pumps auto start to supply train B CCS cooling.	No compensatory measures are required.
B.✓	Cooling to all train B ECCS pumps is lost.	Realign 2B-B CCS pump for B train cooling.
C.	Cooling to all train B ECCS pumps is lost.	Realign 1B-B CCS pump for B train cooling.
D.	Cooling to all train B ECCS pumps is lost.	Realign either the 1B-B or 2B-B CCS pump for B train cooling.

Justification:

A. Incorrect. The 1B-B and 2B-B CCS pumps are not aligned for B train cooling and these pumps will not auto start on a loss of the C-S pump.

B. Correct. Align the unit's B CCS pump that is not aligned to SFP cooling.

C. Incorrect. Align the unit's B CCS pump that is not aligned to SFP cooling.

D. Incorrect. Align the unit's B CCS pump that is not aligned to SFP cooling.

Notes:			
K/A {CFR}:	026AK3.04	[3.5/3.7]	{41.5, 41.10}
	008A2.01	[3.3/3.6]	{41.5, 43.5}
	008G2.4.11	[3.4/3.6]	{41.10, 43.5}
References:	AOP-M.03		
LP/Objectives:	OPL271C425, Obj. 3.		
History:	Rearranged distractors 6/2/04 for readability. Correct answer now b. 8/04 - Converted to A2 format and revised distractors C and D to make more plausible. 7/06 - Moved common compensatory action to the stem to improve readability of choices		
Level:	Analysis.		
Est Time:	3 min		
Comments:			

HLC 0108:		HLC 0109:	
HLC 2006:	3/2/07	LOR Cycle Exam:	
Last Biennial Exam:	2006	Part B (Y/N):	Y
SRO only [Y/N]:		Category 8:	

I. **PROGRAM**: OPERATOR TRAINING - LICENSED

II. **COURSE**: LICENSE TRAINING

III. **LESSON TITLE**: AOP-M.03 "LOSS OF COMPONENT COOLING WATER"

IV. **LENGTH OF LESSON/COURSE**: α1.5 hours

V. **TRAINING OBJECTIVES**:

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate or explain, using classroom evaluations and/or simulator scenarios, the requirements of AOP-M.03, LOSS OF COMPONENT COOLING WATER.

B. Enabling Objectives

	Objectives
0.	Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with Loss of Component Cooling Water that are rated τ 2.5 during Initial License Training and τ 3.0 during License Operator Requalification Training for the appropriate position as identified in Appendix A
1.	State the purpose/goal of AOP-M.03.
2.	Describe the AOP-M.03 entry conditions. a. Describe the setpoints, interlocks, and automatic actions associated with AOP-M.03 entry conditions. b. Describe the ARP requirements associated with AOP-M.03 entry conditions. c. Interpret, prioritize, and verify associated alarms are consistent with AOP-M.03 entry conditions. d. Describe the Administrative and Tech Spec conditions resulting from a Loss of Component Cooling Water.
3.	Describe the initial operator response to stabilize the plant upon entry into AOP-M.03.
4.	Upon entry into AOP-M.03, diagnose the applicable condition and transition to the appropriate procedural section for response.
5.	Summarize the mitigating strategy for the condition that initiated entry into AOP-M.03.
6.	Describe the bases for all limits, notes, cautions, and steps of AOP-M.03.

7.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.
8.	Given a set of initial plant conditions use AOP-M.03 to correctly: a. Recognize entry conditions b. Identify required actions c. Respond to Contingencies d. Observe and Interpret Cautions and Notes
9.	Describe the Tech Spec and TRM actions applicable during the performance of AOP-M.03.
10.	Apply GFE and system response concepts to the abnormal condition – prior to, during and after the abnormal condition.

8. 029 EG2.1.31 008

Given the following:

- Unit 1 is responding to an ATWS following a turbine trip.
- All equipment functioned as required with exception of the Reactor Trip Breakers which failed to OPEN.
- When completing the step for establishing emergency boration flow, the crew notes Pressurizer pressure is 2260 psig and dropping.

For the above conditions, which ONE of the following identifies the existing flowpath for emergency boration and correct status of the Pressurizer PORVs?

	Emergency Boration Flow Path	Pressurizer PORVs
A.	Through CCPIT	Manually OPENED
B.	Through CCPIT	In AUTO and CLOSED
C.	Through charging line	Manually OPENED
D.✓	Through charging line	In AUTO and CLOSED

DISTRACTOR ANALYSIS:

A. *Incorrect, the emergency boration flow path would not be through the CCPIT unless a safety injection had been actuated and the conditions in the stem do not support safety injection actuation. With the pressure at 2260 psig the pressurizer PORVs would be below the lift setpoint of 2335 psig and as identified in the stem of the question, all equipment functioned as designed except for the reactor trip breakers,the PORV would not be manually opened. Plausible because both the flow would be through the CCPIT and the PORV would be manually opened under conditions different than identified in the question during an ATWS event and if the PORVS had been manually opened then the procedure directs the PORVs to be closed when pressure is less than 2135 psig which would have them open at the pressure identified in the question.*

B. *Incorrect, the emergency boration flow path would not be through the CCPIT unless a safety injection had been actuated and the conditions in the stem do not support safety injection actuation. The PORVs being in automatic and closed is correct. Plausible because both the flow would be through the CCPIT under conditions different than identified in the question during an ATWS event and the PORV status is correct.*

C. *Incorrect, the emergency boration flow path would be through the charging line and with the pressure at 2260 psig the pressurizer PORVs would be below the lift setpoint of 2335 psig. As identified in the stem of the question that all equipment functioned as designed except for the reactor trip breakers, the PORV would not be manually opened. Plausible because the emergency boration flow path is correctly identified and the PORV would be placed to manual and opened under different conditions while performing FR-S.1. If the PORVS had been manually opened then the procedure directs the PORVs to be closed when pressure is less than 2135 psig which would have them open at the pressure identified in the question.*

D. *CORRECT, the emergency boration flow path would be through the charging line and with the pressure at 2260 psig the pressurizer PORVs would be below the lift setpoint of 2335 psig. FR-S.1 has the operator check that the PORVs are functioning properly in automatic during the emergency boration step by checking pressurizer pressure less than 2335 psig. PORVs would not be manually opened unless the valves failed to open automatically and the question stem states all equipment functioned as designed with the exception of the reactor trip breakers.*

Question No. 8

Tier 1 Group 1

K/A 029 EG2.1.31
Anticipated Transient Without Scram (ATWS)
Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.

Importance Rating: 4.6 / 4.3

Technical Reference: FR-S.1, Nuclear Power Generation / ATWS, Rev 22
EA-68-4, Emergency Boration, Rev 10

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271FR-S.1 B.6
Given a set of plant conditions use FR-S.1 to correctly:
a. Identify required actions

Question Source:
Bank # __________
Modified Bank # __________
New __X____

Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge _______
Comprehension or Analysis _X_____

10 CFR Part 55 Content: (41.10 / 45.12)

10CFR55.43.b (n/a)

Comments: New question for SQN 1/2009 exam

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4.	**EMERGENCY BORATE** RCS by performing the following:	
	a. **ENSURE** at least one CCP RUNNING.	
	b. **INITIATE** Emergency Boration **USING** EA-68-4.	
	c. **VERIFY** charging flow path established: • FCV-62-90 OPEN • FCV-62-91 OPEN • FCV-62-86 or FCV-62-85 OPEN.	c. **PERFORM** the following: **IF** SI is NOT actuated, **THEN** **ESTABLISH** normal charging flow **USING** EA-62-5, Establishing Normal Charging and Letdown **IF** SI is actuated **OR** normal charging CANNOT be established, **THEN** **ENSURE** CCPIT flow established: 1) **ALIGN** CCP suction to RWST. 2) **OPEN** CCPIT inlet and outlet valves.
	d. **CHECK** pressurizer pressure less than 2335 psig.	d. **ENSURE** pressurizer PORVs and block valves OPEN as necessary UNTIL pressurizer pressure less than 2135 psig.

4.0 OPERATOR ACTIONS

4.1 Section Applicability

1. **IF** entering this instruction from any of the following:

   - FR-S.1, Nuclear Power Generation/ATWS
   - FR-S.2, Loss of Core Shutdown
   - ES-0.2, Natural Circulation Cooldown
   - ECA-0.1, Recovery from Loss Of All AC Power without SI Required
   - ECA-2.1, Uncontrolled Depressurization of All Steam Generators
   - AOP-T.01, Security Events
   - AOP-M.01, Loss of Essential Raw Cooling Water

   THEN
   PERFORM the following:

   a. **IF** using BAT as boration source,
   THEN
   GO TO Section 4.2, Emergency Boration from BAT. ☑

   OR

   b. **IF** using RWST as boration source,
   THEN
   GO TO Section 4.3, Emergency Boration from RWST. ☑

EITHER will STILL USE Charging Line IF SI NOT ACTUATED

4.2 Emergency Boration from BAT

1. **PLACE** boric acid transfer pumps in fast speed. ☐

2. **ADJUST** emergency borate valve **[FCV-62-138]** to obtain boric acid flow between 35 gpm and 150 gpm on **[FI-62-137A]**. ☐

3. **MONITOR** emergency boration flow:

   a. **CHECK** emergency boration flow established on **[FI-62-137A]**. ☐

   b. **IF** boric acid flow less than 35 gpm,
   THEN
   CLOSE recirculation valve for the BAT aligned to the blender: ☐

   - 1-FCV-62-237 for BAT A.
   - 0-FCV-62-241 for BAT C.
   - 2-FCV-62-237 for BAT B.

4. **IF** emergency boration flow NOT established,
   THEN
   ALIGN normal boration path:

   a. **VERIFY** VCT outlet valves LCV-62-132 and LCV-62-133 OPEN. ☐

   b. **ALIGN** normal boration to VCT outlet:

   - **OPEN** FCV-62-140. ☐
   - **OPEN** FCV-62-144. ☐

   c. **CHECK** boration flow greater than 35 gpm on FI-62-139. ☐

4.2 Emergency Boration from BAT (Continued)

5. **IF** boration flow greater than 35 gpm is NOT established,
   THEN
   PERFORM one of the following:

   - **GO TO** Section 4.3 to emergency borate from RWST. ☐

     OR

   - **ALIGN** alternate emergency boration:

     1) **ENSURE** FCV-62-140 OPEN. ☐

     2) **LOCALLY OPEN** boric acid to CCP valve VLV-62-929.
        [Aux Bldg, elev 690, boric acid blender] ☐

     3) **CHECK** boration flow greater than 35 gpm on FI-62-139. ☐

6. **VERIFY** charging flow established. ☐

CAUTION **Boration flowrate greater than charging flow (minus seal return flow) will result in overfilling VCT.**

7. **MAINTAIN** boric acid flow between 35 gpm and 150 gpm. ☐

8. **MONITOR** BAT level. ☐

4.3 Emergency Boration from RWST

1. **OPEN** RWST supply to CCP suction **[LCV-62-135]** and **[LCV-62-136]**. ☐

2. **CLOSE** VCT outlet valves **[LCV-62-132]** and **[LCV-62-133]**. ☐

3. **IF** CCPIT flow already established (SI actuated)
THEN
GO TO Step 7. ☐

NO SI Actuated (CCPIT VALVES CLOSED)

4. **ADJUST** normal charging flow to at least 90 gpm
USING **[FCV-62-93]** and **[FCV-62-89]**. ☐

5. **IF** required boration flow cannot be obtained using normal charging path,
THEN
ALIGN CCPIT flow path:

   a. **OPEN** CCPIT outlet valve **[FCV-63-26]** or **[FCV-63-25]**. ☐

   b. **OPEN** CCPIT inlet valve **[FCV-63-39]** or **[FCV-63-40]**. ☐

6. **MONITOR** pressurizer level and RWST level. ☐

7. **IF** FR-S.1 (ATWS) or FR-S.2 (Loss of Core Shutdown) condition exists,
THEN
RETURN TO procedure and step in effect. ☐

I. PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: FR-S.1, NUCLEAR POWER GENERATION / ATWS

IV. LENGTH OF LESSON/COURSE: 1.5 hours

V. TRAINING OBJECTIVES:

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate or explain, using classroom evaluations and/or simulator scenarios, the requirements of FR-S.1, NUCLEAR POWER GENERATION / ATWS.

B. Enabling Objectives

0.	Demonstrate an understanding of NUREG 1122 Knowledge's and Abilities associated with FR-S.1, NUCLEAR POWER GENERATION / ATWS that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate license position as identified in Appendix A.
1.	Explain the purpose/goal of FR-S.1.
2.	Discuss the FR-S.1 entry conditions. a. Describe the setpoints, interlocks, and automatic actions associated with FR-S.1 entry conditions. b. Describe the requirements associated with FR-S.1 entry conditions.
3.	Summarize the mitigating strategy for the failure that initiated entry into FR-S.1.
4.	Describe the bases for all limits, notes, cautions, and steps of FR-S.1.
5.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.
6.	Given a set of initial plant conditions use FR-S.1 to correctly: a. Identify required actions b. Respond to Contingencies c. Observe and Interpret Cautions and Notes
7.	Apply GFE and system response concepts to the performance of FR-S.1 conditions.

9. 040 AK1.06 009

Given the following:

- Unit 2 is at 100% power.
- SG #3 main steam line ruptured inside containment.
- Containment pressure is 6 psig and rising.

Which ONE of the following describes the requirements for controlling AFW flow and maintaining SG levels for the event in progress?

A. Continue to feed **ALL** SGs with > 440 gpm AFW flow until one intact SG > 10% narrow range level, then
Maintain intact SG narrow range levels between 10% and 50%.

B. Continue to feed **ALL** SGs with > 440 gpm AFW flow until one intact SG > 25% narrow range level, then
Maintain intact SG narrow range levels between 25% and 50%.

C. Continue to feed only the **INTACT** SGs at > 440 gpm AFW flow until one intact SG > 10% narrow range level, then
Maintain intact SG narrow range levels between 10% and 50%.

D✓ Continue to feed only **INTACT** SGs at > 440 gpm AFW flow until one intact SG > 25% narrow range level, then
Maintain intact SG narrow range levels between 25% and 50%.

DISTRACTOR ANALYSIS:

A. *Incorrect, All steam generators would not be fed, the faulted one (#3) would be isolated either by Prudent Operator Action or when directed in E-2. Plausible because the 10% narrow range for heat sink and for the lower end of the control band would be correct if containment was not adverse.*

B. *Incorrect, All steam generators would not be fed, the faulted one (#3) would be isolated either by Prudent Operator Action or when directed in E-2. Plausible because the level requirements for heat sink and the lower end of the control band are correct.*

C. *Incorrect, Maintaining flow to only the intact steam generator in correct but the narrow range level required is 25% instead of the listed 10%. Plausible because the 10% narrow range for heat sink and for the lower end of the control band would be correct if containment was not adverse.*

D. *CORRECT, A double-ended steam line line break inside containment would result in a Phase B containment isolation resulting in the use of adverse containment setpoints in the Emergency Instructions. Heat sink requirements are at least 440 gpm AFW flow or at least one steam generator narrow range level greater than 25%. The AFW to the faulted steam generator will be isolated and the other 3 steam generators will be fed at greater than 440 gpm total AFW flow until at least one is greater than 25% narrow range. Then the AFW flow can be reduced to the intact steam generators and level maintained from 25% to 50% narrow range.*

Question No. 9

Tier 1 Group 1

K/A 040 AK1.06
Knowledge of the operational implications of the following concepts as they apply to Steam Line Rupture: High energy steam line break considerations.

Importance Rating: 3.7 / 3.8

Technical Reference: E-0, Reactor Trip or Safety Injection, Rev 30
E-2, Faulted Steam Generator Isolation, Rev 12

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271E-2 B.6.a
Given a set of initial plant conditions use E-2 to correctly :
a. Identify required actions.
OPL271E-2 B.6.b
Given a set of initial plant conditions use E-0 to correctly :
b. Identify required actions.

Question Source:
Bank # ____X_____
Modified Bank # __________
New _______

Question History: Turkey Point question

Question Cognitive Level:
Memory or fundamental knowledge __X____
Comprehension or Analysis ______

10 CFR Part 55 Content: (41.8 / 41.10 / 45.3)

10CFR55.43.b (n/a)

Comments: Turkey Point question with numbers changed for SQN.

000040AK1.06 001

With Unit 4 at 100% power, 4B S/G main steam line experienced a double-ended break inside containment.

Which ONE of the following describes how operators will control AFW to maintain S/G levels?

A. Continue to feed all S/Gs with > 345 gpm AFW flow until one intact S/G is > 6% narrow range level, then
Maintain intact S/G narrow range levels between 6% and 50%.

B. Continue to feed all S/Gs with > 345 gpm AFW flow until one intact S/G is > 32% narrow range level, then
Maintain intact S/G narrow range levels between 32% and 50%.

C. Continue to feed only the intact S/Gs at > 345 gpm AFW flow until one intact S/G is > 6% narrow range level, then
Maintain intact S/G narrow range levels between 6% and 50%.

D. Continue to feed only the intact S/Gs at > 345 gpm AFW flow until one intact S/G is > 32% narrow range level, then
Maintain intact S/G narrow range levels between 32% and 50%.

000040AK1.06

Knowledge of the operational implications of the following concepts as they apply to Steam Line Rupture: High energy steam line break considerations.	3.7 /3.8

Reference: 4-EOP-E-0, Step 22b
FSAR, Section 14.3.4.2.1, Table 14.3.4.3-10

Cognitive Level: 2 Comprehension

New Question

Category 1:	Category 2: FPL
Category 3:	Category 4:
Category 5:	Category 6:
Category 7:	Category 8:

QUESTIONS REPORT
for Jones FPL New not converted

Test Name	Test Date	rpb	p(Diff)	Time	Equ	User Values	
<Cumulative>		0.000	0.000	0	N	1: 0	2: 0
						3: 0	4: 0

	--- A ---			--- B ---			--- C ---			--- D ---					
	Resp	%	Avg	Resp	%	Avg	Resp	%	Avg	Resp	%	Avg	Resp	%	Avg
<Cumulative>						Total:	0	100			Omits:		0	0	
	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00			

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7.	**CHECK** SI termination criteria:	
	a. RCS subcooling based on core exit T/Cs greater than 40°F.	a. **GO TO** Step 8.
	b. Secondary heat sink: • Narrow range level in at least one Intact S/G greater than 10% [25% ADV] **OR** • Total feed flow to Intact S/Gs greater than 440 gpm.	b. **GO TO** Step 8.
	c. RCS pressure stable or rising.	c. **GO TO** Step 8.
	d. Pressurizer level greater than 10% [20% ADV].	d. **GO TO** Step 8.
	e. **GO TO** ES-1.1, SI Termination.	
8.	**GO TO** E-1, Loss of Reactor or Secondary Coolant.	

END

10. 054 AK1.02 010

Given the following:

- FR-H.1, "Loss Of Secondary Heat Sink", is in progress.
- RCS bleed and feed had been initiated when Auxiliary Feedwater (AFW) capability was restored.
- All SGs indicate approximately 8% Wide Range level and approximately 50 psig.
- Incore TC temperatures are stable at 450°F.

Which ONE of the following describes how to establish feed flow under these conditions and why?

A. Feed ONLY one (1) SG at minimum rate to ensure RCS cooldown rates are established within Technical Specification limits.

B.✓ Feed ONLY one (1) SG at minimum rate to minimize thermal shock to SG components.

C. Feed ALL SGs at maximum rate to establish subcooled conditions in the RCS as soon as possible.

D. Feed ALL SGs at maximum rate to allow termination of RCS bleed and feed as soon as possible.

DISTRACTOR ANALYSIS:

A. Incorrect, Plausible because only one selected steam generator should be fed and the cooldown rates should be kept within TS limits, but the reason for minimum flow to one SG is to protect the 'Hot,dry' steam generators.

B. CORRECT, One SG is fed at minimal rate to minimize thermal shock and potential damage to the SG tubesheet when SGs are hot and dry. After feeding a minimal rate, flow may be raised later. One at a time to determine if tube leakage is occurring.

C. Incorrect, Plausible because red conditions on core cooling may occur if red conditions on heat sink are not addressed and because the selected steam generator would be fed at the maximum rate if the core exit TCs were rising.

D. Incorrect, Plausible because if bleed and feed is established, it is desirable to establish AFW to terminate the loss of RCS fluid as quickly as possible and because the selected steam generator would be fed at the maximum rate if the core exit TCs were rising.

Question No. 10

Tier 1 Group 1

K/A 054 AK1.02
Knowledge of the operational implications of the following concepts as they apply to Loss of Main Feedwater (MFW): Effects of feedwater introduction on dry S/G.

Importance Rating: 3.6 / 4.2

Technical Reference: FR-H.1, Loss of Secondary Heat Sink, Rev 17

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271FR-H.1 B.6.a
Given a set of initial plant conditions use FR-H.1 to correctly:
a. Identify required actions

Question Source:
Bank # __X_______
Modified Bank # __________
New ________

Question History: VC SUMMER 2006 RETAKE 054 AK1.02

Question Cognitive Level:
Memory or fundamental knowledge ________
Comprehension or Analysis _X_____

10 CFR Part 55 Content: (41.8 / 41.10 / 45.3)

10CFR55.43.b (n/a)

Comments: VC SUMMER 2006 RETAKE

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
31.	b. **CHECK** wide range level on selected S/G greater than 10% [30% ADV]	b. **CONTROL** feedwater flow to dry S/G as follows: 1) **IF** AFW flow is available, **THEN** **CONTROL** feed flow to one S/G between 25 and 100 gpm. 2) **IF** only condensate flow available, **THEN** **CONTROL** condensate flow as low as achievable while maintaining the following: • Core Exit TCs DROPPING • wide range S/G level RISING. 3) **WHEN** wide range level greater than 10% [30% ADV], **THEN** **PERFORM** Substep 31.c. **GO TO** Substep 31.d.
	c. **CONTROL** S/G feed flow as necessary to restore narrow range level in selected S/G between 10% [25% ADV] and 50%.	
	d. **NOTIFY** Chem Lab to sample S/G being fed for activity.	

(Step continued on next page.)

EOP Step Number: 31

CONTROL feed flow to S/G:

ERG Step Number: NA

Purpose:

To provide the operating crew with guidance on feeding a dry steam generator.

ERG Basis:

NA

EOP Basis: (from DW-95-040)

If bleed and feed has been initiated, during restoration of secondary heat sink, feeding a dry steam generator may be necessary. If the event was initiated from high temperature and high decay heat conditions it is likely that feedwater flow will have to be established to a hot, dry steam generator. A hot, dry steam generator is defined as a steam generator in which the primary side of the steam generator is above 550F and the secondary side has no liquid inventory. Re-establishment of feedwater is the more desirable mode of recovery from a loss of secondary heat sink than remaining on bleed and feed and establishing cold leg recirculation for long term cooling because this will be more likely to avoid core uncovery. However, care must be taken when re-establishing feedwater to minimize the effects of thermal shock consistent with the urgency of the need to restore the secondary side heat sink.

Since the heat removal capability of one steam generator is always greater than decay heat, it is advisable to re-establish feedwater to only one steam generator regardless of the size of the plant or number of loops. Thus, if a failure in an SG occurs due to excessive thermal stresses, the failure is isolated to one steam generator.

If bleed and feed has been initiated and RCS temperature is increasing, the re-establishment of feedwater flow should be limited to one steam generator and the flow rate used should be as high as can be made available due to the urgency of the situation. If RCS temperatures are stable or decreasing when feedwater flow is restored the flow should be directed to one steam generator and the rate should be limited to the plant-specific equivalent of 25-100 gpm until wide range level is established. With stable or decreasing RCS temperatures, the feedwater flow rate is limited to minimize the potential impact of excessive thermal stresses since a direct measure of the steam generator temperature is not available. Once an indicated wide range level is achieved in the affected steam generator, feedwater can be adjusted as necessary to restore level into the narrow range and thereby satisfying the requirements for a secondary heat sink.

QUESTIONS REPORT
for summer 10-4-06

054 AK1.02 001

Given the following plant conditions:

- *EOP-15.0, Response to Loss of Secondary Heat Sink*, is being implemented.
- RCS bleed and feed has been initiated when Emergency Feedwater (EFW) capability is restored.
- All SGs indicate approximately 8% Wide Range and approximately 50 psig.

Which ONE (1) of the following describes the strategy used to re-establish feed under these conditions?

a. Feed ONLY one (1) SG to ensure RCS cooldown rates are established within Technical Specification limits

b.✓ Feed ONLY one (1) SG to minimize thermal shock to SG components

c. Feed ALL SGs to establish subcooled conditions in the RCS as soon as possible

d. Feed ALL SGs to allow termination of RCS bleed and feed as soon as possible

I. **PROGRAM:** OPERATOR TRAINING - LICENSED

II. **COURSE:** LICENSE TRAINING

III. **LESSON TITLE:** FR-H.1, LOSS OF SECONDARY HEAT SINK

IV. **LENGTH OF LESSON/COURSE:** 2 hours

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate or explain, using classroom evaluations and/or simulator scenarios, the requirements of FR-H.1, Loss Of Secondary Heat Sink.

B. Enabling Objectives

0.	Demonstrate an understanding of NUREG 1122 Knowledge's and Abilities associated with FR-H.1, Loss Of Secondary Heat Sink, that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate license position as identified in Appendix A.
1.	Explain the purpose/goal of FR-H.1.
2.	Discuss the FR-H.1 entry conditions. a. Describe the setpoints, interlocks, and automatic actions associated with FR-H.1 entry conditions. b. Describe the requirements associated with FR-H.1 entry conditions.
3.	Summarize the mitigating strategy for the failure that initiated entry into FR-H.1.
4.	Describe the bases for all limits, notes, cautions, and steps of FR-H.1.
5.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.
6.	Given a set of initial plant conditions use FR-H.1 to correctly: a. Identify required actions b. Respond to Contingencies c. Observe and Interpret Cautions and Notes
7.	Apply GFE and system response concepts to the performance of FR-H.1 conditions.

11. 055 EK2.04 011

Given the following:

- The crew is performing ECA-0.0, "Loss Of All AC Power".
- ECA-0.0, Appendix A, Locking Out Shutdown Board Loads has been completed.
- Offsite power has been restored and the crew is ready to re-energize the Shutdown Boards.

Which ONE of the following identifies the pumps that will remain in A-AUTO and available to start when power is restored to the Shutdown Boards?

A. Centrifugal Charging Pumps

B. Component Cooling Water Pumps

C✓ Essential Raw Cooling Water Pumps

D. Motor Driven Auxiliary Feedwater Pumps

<u>*DISTRACTOR ANALYSIS:*</u>

A. Incorrect, the Centrifugal Charging Pumps (CCPs) are placed in the Pull-to-Lock position in accordance with Appendix A of ECA-0.0. Plausible because the CCPs supply seal injection water to the RCP seals and the RCP seals are a critical component during a loss of all AC.

B. Incorrect, the Component Cooling Water (CCS) Pumps are placed in the Pull-to-Lock position in accordance with Appendix A of ECA-0.0. Plausible because the CCS pumps supply cooling to the RCP Thermal Barriers which provides cooling to the RCP seals and the RCP seal are a critical component during a loss of all AC.

C. CORRECT, the Essential Raw Cooling Water Pumps are left in A-Auto to prevent D/G damage due to overheating as identified in the Appendix of ECA-0.0.

D. Incorrect, the Motor Driven Auxiliary Feedwater (MDAFW) Pumps are placed in the Pull-to-Lock position in accordance with Appendix A of ECA-0.0. Plausible because the MDAFW pumps supply the steam generators which are providing the heat sink for the reactor and the AFW pumps supply their on cooling water, therefore, are not reliant on other pumps for cooling.

Question No. 11

Tier 1 Group 1

K/A 055EK2.04
Knowledge of the interrelations between the and the following Station Blackout:
Pumps

Importance Rating: *No rating provided in KA Catalog*

Technical Reference: ECA-0.0, Loss of All AC Power, Rev 22

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271ECA-0.1 B.6.a
Given a set of initial plant conditions use ECA=0.0 to correctly: a. Identify required actions

Question Source:
Bank # __________
Modified Bank # __________
New _X______

Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge _X______
Comprehension or Analysis _______

10 CFR Part 55 Content: (41.7 / 45.7)

10CFR55.43.b (n/a)

Comments:

APPENDIX A

LOCKING OUT SHUTDOWN BOARD LOADS

CAUTION **To prevent D/G damage due to overheating, ERCW pumps are left in A-AUTO to provide D/G cooling as soon as possible after shutdown board is energized.**

1. **PLACE** following equipment switches in PULL TO LOCK (or OFF if specified):

- MD AFW pumps ☐
- CCPs ☐
- RHR pumps ☐
- SI pumps ☐
- Containment spray pumps ☐
- CCS pumps on affected unit ☐
- Thermal barrier booster pumps on affected unit ☐
- Pressurizer heater groups C and D ☐
- Pressurizer heater groups A and B (OFF). ☐

I. PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: EMERGENCY OPERATING PROCEDURE ECA-0.0, LOSS OF ALL AC POWER

IV. LENGTH OF LESSON/COURSE: 1 hour

V. TRAINING OBJECTIVES:

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate or explain, using classroom evaluations and/or simulator scenarios, the requirements of ECA-0.0, LOSS OF ALL AC POWER.

B. Enabling Objectives

0.	Demonstrate an understanding of NUREG 1122 Knowledge's and Abilities associated with ECA-0.0, LOSS OF ALL AC POWER that are rated $\geq$ 2.5 during Initial License Training and $\geq$ 3.0 during License Operator Requalification Training for the appropriate license position as identified in Appendix A.
1.	Explain the purpose/goal of ECA-0.0.
2.	Discuss the ECA-0.0 entry conditions.
3.	Summarize the mitigating strategy for the failure that initiated entry into ECA-0.0.
4.	Describe the bases for all limits, notes, cautions, and steps of ECA-0.0.
5.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.
6.	Given a set of initial plant conditions use ECA-0.0 to correctly: a. Identify required actions b. Respond to Contingencies c. Observe and Interpret Cautions and Notes
7.	Apply GFE and system response concepts to the performance of ECA-0.0 conditions.

12. 056 AA1.11 012

Given the following:

- A Large Break LOCA occurred on Unit 1.
- A loss of offsite power occurs after ES-1.3, "Transfer To RHR Containment Sump" had been completed.
- Shutdown Boards 1A and 1B were re-energized by the diesel generators.

In accordance with ES-1.3, which ONE of the following sequence of actions is taken to restore core cooling following the loss of offsite power?

A. Restart the RHR pumps.
Restart the SI pumps.
Ensure the CCPs auto start.

B.✓ Place the CCPs in Pull-To-Lock.
Restart the RHR pumps.
Restart the CCPs and SI pumps.

C. Ensure the RHR pumps auto start.
Restart the SI pumps.
Ensure the CCPs auto start.

D. Place the CCPs in Pull-To-Lock.
Ensure the RHR and SI pumps auto start.
Restart CCPs.

<u>*DISTRACTOR ANALYSIS:*</u>

Since operators have completed ES-1.3, RHR is providing the suction source to both the charging and SI pumps and SI has been reset. RHR and SI pumps do not automatically start on an undervoltage after the SI is reset. Charging pumps are placed in PTL because they start automatically on undervoltage and, until RHR is restored, they have lost their suction source. The SI pumps will not automatically start because SI has been reset. SI pumps are required when RCS pressure is less than 1500 psig (for a large break LOCA, pressure will be approximately atmospheric).

A. *Incorrect. Charging pumps must be placed in PTL. Plausible if applicant cannot recall major actions of ES-1.3 and does not understand charging and RHR system interrelationships in recirculation.*

B . *CORRECT per ES-1.3, Step 15 Caution and Step 16.*

C. *Incorrect. RHR pumps do not automatically start on a blackout (and the SI signal has been reset). Charging pumps must be placed in PTL because, without RHR, they have lost their suction source. Plausible if applicant cannot recall major actions of ES-1.3 and does not understand charging and RHR system interrelationships in recirculation.*

D. *Incorrect. RHR pumps do not automatically start. Plausible if applicant cannot recall major actions of ES-1.3 and does not understand charging and RHR system interrelationships in recirculation.*

Question No. 12

Tier 1 Group 1

K/A 056 AA1.11
Ability to operate and / or monitor the following as they apply to the Loss of Offsite Power: HPI system

Importance Rating: 3.7 / 3.7

Technical Reference: ES-1.3, Transfer to RHR Containment Sump, Rev 15

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271ES-1.3, Obj 6
Given a set of initial plant conditions use ES-1.3 to correctly: a. Identify required actions

Question Source:
Bank # _X________
Modified Bank # __________
New ________

Question History: SQN Bank question ES-1.3-B.6 001 with changes made but not enough to be significant modification.

Question Cognitive Level:
Memory or fundamental knowledge ________
Comprehension or Analysis __X____

10 CFR Part 55 Content: (41.7 / 45.5 / 45.6)

10CFR55.43.b (n/a)

Comments: SQN Bank question ES-1.3-B.6 001 with changes made but not enough to be significant modification. Correct answer location changed.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
14.	c. **CHECK** at least one SI pump RUNNING.	c. **IF** RCS pressure is less than 1500 psig, **THEN** **RESTART** any SI pumps which were stopped due to RWST level less than or equal to 8%.

CAUTION **Momentary loss of shutdown power while aligned for sump recirculation could result in CCP damage since the blackout sequencer will start the CCPs but will NOT start the RHR pumps.**

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
15.	**MONITOR** shutdown boards continuously energized.	**IF** shutdown board power lost, **THEN** **PULL TO LOCK** affected CCP(s). **WHEN** shutdown board(s) re-energized, **THEN** **PERFORM** the following: a. **RESTART** affected RHR pump(s). b. **RESTART** affected CCP(s). c. **IF** RCS pressure less than 1500 psig, **THEN** **RESTART** affected SI pump(s).
16.	**RESET** SI signal.	
17.	**ALIGN** ERCW System **USING** EA-67-1, ERCW Operation.	

QUESTIONS REPORT
for thQuestions

1. ES-1.3-B.6 001

Given the following:

- A <u>Large Break LOCA</u> occurred on Unit 1
- Operators are performing the last step of ES-1.3, Transfer to RHR Containment Sump
- Offsite power was just lost
- All shutdown boards have been reenergized by their associated diesel generators

Which one of the following describes the correct sequence of actions the operators must take to restore core cooling per ES-1.3?

A. After the RHR pumps automatically start, then restart SI pumps.
Charging pumps are left in A-AUTO because they are started by the blackout sequencer.

B. Restart RHR pumps.
Restart SI pumps.
Charging pumps are left in A-AUTO because they are started by the blackout sequencer.

C. Place charging pumps in Pull To Lock.
After the RHR pumps automatically start, then restart charging pumps and SI pumps.

D✓ Place charging pumps in Pull To Lock.
Restart RHR pumps.
Restart charging pumps and SI pumps.

Justification:

A *Incorrect. RHR pumps do not automatically start on a blackout (and the SI signal has been reset). Charging pumps must be placed in PTL because, without RHR, they have lost their suction source. Plausible if applicant cannot recall major actions of ES-1.3 and does not understand charging and RHR system interrelationships in recirculation.*

B *Incorrect. Charging pumps must be placed in PTL. See A.*

C *Incorrect. RHR pumps do not automatically start. See A.*

D *Correct per ES-1.3, Step 16 Caution and Step 17.*

Since operators are performing the last step of ES-1.3, RHR is providing the suction source to both the charging and SI pumps and SI has been reset. RHR and SI pumps do not automatically start on an undervoltage. Charging pumps are placed in PTL because they start automatically on undervoltage and, until RHR is restored, they have lost their suction source. The SI pumps will not automatically start because SI has been reset. SI pumps are required when RCS pressure is less than 1500 psig (for a large break LOCA, pressure will be approximately atmospheric).

I. PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: ES-1.3, "Transfer to RHR Containment Sump"

IV. LENGTH OF LESSON/COURSE: 1 hour(s)

V. TRAINING OBJECTIVES:

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate or explain, using classroom evaluations and/or simulator scenarios, the requirements of ES-1.3, Transfer to RHR Containment Sump.

B. Enabling Objectives

0.	Demonstrate an understanding of NUREG 1122 Knowledge's and Abilities associated with Transfer to RHR Containment Sump that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate license position as identified in Appendix A.
1.	Explain the purpose/goal of ES-1.3.
2.	Discuss the ES-1.3 entry conditions. a. Describe the setpoints, interlocks, and automatic actions associated with ES-1.3 entry conditions. b. Describe the requirements associated with ES-1.3 entry conditions.
3.	Summarize the mitigating strategy for the failure that initiated entry into ES-1.3.
4.	Describe the bases for all limits, notes, cautions, and steps of ES-1.3.
5.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.
6.	Given a set of initial plant conditions use ES-1.3 to correctly: a. Identify required actions b. Respond to Contingencies c. Observe and Interpret Cautions and Notes
7.	Apply GFE and system response concepts to the performance of ES-1.3 conditions.

13. 057 AK3.01 013
Given the following:

- Unit 1 is at 100% RTP.
- MCR alarms received indicate that an electrical board has failed.
- All trip status lights on Panel 1-XX-55-5 (1-M-5) are OFF .
- The crew responds in accordance with the appropriate procedure.

Which ONE of the following identifies (**1**) the electrical board that failed and (**2**) the reason that manipulation of Auxiliary Feedwater (AFW) controls will be required?

	(1)	(2)
A.✓	120 VAC Vital Instrument Board 1-I.	To prevent overcooling due to excessive AFW flow due to the LCVs failing open.
B.	120 VAC Vital Instrument Board 1-I.	To allow the turbine driven AFW pump to be operated above minimum speed.
C.	120 VAC Vital Instrument Board 1-II.	To prevent overcooling due to excessive AFW flow due to the LCVs failing open.
D.	120 VAC Vital Instrument Board 1-II.	To allow the turbine driven AFW pump to be operated above minimum speed.

DISTRACTOR ANALYSIS:

A. *CORRECT, The board failure is correct, and the MD AFW pump 1A-A LCVs do fail open causing excessive flow requiring the pump to be stopped in accordance with AOP-P.03*

B. *Incorrect, The board failure is correct, but the TD AFW pump is not affected by the 1-I board failure. Plausible because the TD AFW pump speed control would be affected if the failure was the 120 VAC Vital Instrument Board 1-III or if the 120 VAC Vital Instrument Board 1-I failure had occurred on Unit 2. If the pump ws opeating at minimum speed it would not develop enough pressure to be able to pump water to the steam geenrator*

C. *Incorrect, The board failure is incorrect, but the MD AFW pump 1B-B LCVs do fail open causing excessive flow requiring the pump to be stopped in accordance with AOP-P.03. Plausible because the excessive flow would occur due to the 120 VAC Vital Instrument Board 1-II failure and the candidate however the I-II board failure would not caused all Status Lights to be off.*

D. *Incorrect, The board failure and the AFW manipulation are incorrect. Plausible because the failure was the 120 VAC Vital Instrument Board 1-II would cause required manipulations of the AFW controls and a different board failure would require the TD AFW pump speed control power supply to be swapped to restore allow speed to be controlled above minimum speed in order to allow speed to rise sufficiently to pump water into the steam generators.*

Question No. 13

Tier 1 Group 1

K/A 057 AK3.01
Knowledge of the reasons for the following responses as they apply to the Loss of Vital AC Instrument Bus: Actions contained in EOP for loss of vital ac electrical instrument bus.

Importance Rating: 4.1 / 4.4

Technical Reference: AOP-P.03, Loss of Unit 1 Vital Instrument Power Board, Rev. 21

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271AOP-P.03 & P.04 B.2.d
Describe AOP-P.03 & -P.04 entry conditions
d. Describe the plant parameters that may indicate a Loss of a Vital Instrument Power Board

Question Source:
Bank # _________
Modified Bank # __X_______
New _________

Question History: WBN bank modified

Question Cognitive Level:
Memory or fundamental knowledge ________
Comprehension or Analysis __X____

10 CFR Part 55 Content: (41.5 / 41.10 / 45.6 / 45.13)

10CFR55.43.b (n/a)

Comments:

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2.0 OPERATOR ACTIONS

1. **DIAGNOSE** the failure:

IF…	GO TO SECTION	PAGE
ALL channels' status lights DARK, **AND** 120V AC VITAL POWER BOARD 1-I UV OR BKR TRIP Annunciator [1-M-1C, A-7] LIT	2.1	4
Channel II status lights LIT, **AND** 120V AC VITAL POWER BOARD 1-II UV OR BKR TRIP Annunciator [1-M-1C, B-7] LIT	2.2	15
Protection Set 3 Trouble light LIT [1-M-5] **AND** 120V AC VITAL POWER BOARD 1-III UV OR BKR TRIP Annunciator [1-M-1C, C-7] LIT	2.3	24
Channel IV status lights LIT, **AND** 120V AC VITAL POWER BOARD 1-IV UV OR BKR TRIP Annunciator [1-M-1C, D-7] LIT	2.4	31

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2.1 Loss of 120V AC Vital Instrument Power Board 1-I (cont'd)

NOTE 1 AFW flow indications to loops 2 and 4 (1-FI-3-155 & 1-FI-3-170) fail low.

NOTE 2 Loops 1 and 2 MDAFW LCVs cannot be closed or modulated from their controllers. The main LCV will close and the bypass LCV will open when the manual bypass position is selected after depressing accident reset. MDAFW pump 1A-A may have to be stopped if additional AFW flow reduction is required by the applicable EOP, to prevent excessive RCS cooldown or S/G overfill.

NOTE 3 Manual control of TDAFWP LCVs and Manual/Automatic control of Loop 3 and 4 MDAFWP LCVs are unaffected by this failure.

7. **IF** AFW flow must be reduced to S/G 1 or 2 to prevent excessive RCS cooldown OR S/G overfill, **THEN** **EVALUATE** stopping MD AFW pump 1A-A.

NOTE 1 Steam Dumps fail closed due to loss of power.

NOTE 2 Manual and Automatic control is failed for S/G 1 and 4 Atmospheric Relief Valve PIC's. Automatic control is available for S/G 2 and 3 Atmospheric Relief Valves.

8. **MONITOR** RCS temperature.

   a. **IF** RCS temperature is greater than 552°F, **THEN** **DUMP** steam **USING** S/G 2 and 3 atmospheric relief valves.

NOTE 1 1-HIC-74-16 and 1-HIC-74-32 fail open and 1-HIC-62-83 fails closed due to loss of power to plugmold.

NOTE 2 Train A RHR temperature indications and Train B Heat Exchanger outlet temperature is lost.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	b. **CHECK** RHR NOT in service for shutdown cooling.	b. **IF** RHR Train A is in service for shutdown cooling, **THEN** **EVALUATE** Removing Train A RHR from service and placing Train B RHR in service **USING** 0-SO-74-1, RHR System.

WBN Question

Given the following plant conditions:

- Unit 1 is at 100% power.
- Alarms received indicate that an electrical board has failed.
- All trip status lights are OFF on Panel 1-XX-55-5 (on 1-M-5).

Which ONE of the following identifies (1) which electrical board failed and (2) the reason that manipulation of controls in the Auxiliary Control Room (ACR) is required?

	(1)	(2)
A.	120 VAC Vital Instrument Board 1-I.	ACR Auxiliary Feedwater Controllers for S/G 3 and 4 have swapped to MANUAL and require adjustment to ensure an operable heat sink is maintained.
B.	120 VAC Vital Instrument Board 1-II.	ACR Auxiliary Feedwater Controllers for S/G 1 and 2 have swapped to MANUAL and require adjustment to ensure an operable heat sink is maintained.
C.	120 VAC Vital Instrument Board 1-I.	1-FCV-62-93 and 1-FCV-62-89 have failed OPEN and related controls must be taken to the AUX position to reestablish charging and RCP seal flows.
D.	120 VAC Vital Instrument Board 1-II.	1-FCV-62-93 and 1-FCV-62-89 have failed OPEN and related controls must be taken to the AUX position to reestablish charging and RCP seal flows.

DISTRACTOR ANALYSIS

a. Incorrect. The board failure is correct, and the ACR AFW controllers do swap to MANUAL but the SG AFW controllers are incorrect (Board 1-I would shift controllers for S/G 1 and 2).

b. Incorrect. The board failure is correct, and the ACR AFW controllers do swap to MANUAL but the SG AFW controllers are incorrect (Board 1-II would shift controllers for S/G 3 and 4).

c. CORRECT. AOI-25.01 states that the listed flow control valves will fail OPEN, and Appendix C , Alternate Control of Letdown and Charging specifically addresses placing the transfer switches for 1-FCV-62-93 and 1-FCV-62-89 in the AUX position on Panel 1-L-11B and 1-L-11A respectively.

d. Incorrect. The board failure is correct, but the fail positions of the flow control valves are incorrect.

I. PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: AOP-P.03 & .04, LOSS OF 120V AC VITAL INSTRUMENT POWER BOARDS

IV. LENGTH OF LESSON/COURSE: 4.0 hour(s)

V. TRAINING OBJECTIVES:

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate *or* explain, using classroom evaluations and/or simulator scenarios, the requirements of AOP-P.03 & .04, LOSS OF 120V AC VITAL INSTRUMENT POWER BOARDS.

B. Enabling Objectives:

	Objectives
0.	Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with Loss of a Vital Instrument Power Board that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate position as identified in Appendix A.
1.	State the purpose/goal of this AOP-P.03 & -P.04.
2.	Describe the AOP-P.03 & -P.04 entry conditions.
	a. Describe the setpoints, interlocks, and automatic actions associated with AOP-P.03 & -P.04 entry conditions.
	b. Describe the ARP requirements associated with AOP-P.03 & -P.04 entry conditions.
	c. Interpret, prioritize, and verify associated alarms are consistent with AOP-P.03 & -P.04 entry conditions.
	d. Describe the plant parameters that may indicate a Loss of a Vital Instrument Power Board.
3.	Describe the initial operator response to stabilize the plant upon entry into AOP-P.03 & -P.04.
4.	Upon entry into AOP-P.03 & -P.04, diagnose the applicable condition and transition to the appropriate procedural section for response.
5.	Summarize the mitigating strategy for the failure that initiated entry into AOP-P.03 & -P.04.
6.	Describe the bases for all limits, notes, cautions, and steps of AOP-P.03 & -P.04.
7.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.

14. 058 AA1.01 014

Given the following conditions:

- Unit 1 is at 100% power.
- Unit 2 is in Mode 6 with upper internals removal in progress.
- 125V DC Vital Battery III output breaker tripped and can **NOT** be reclosed.

Which ONE of the following describes the required actions?

REFERENCE PROVIDED

A. Align 125V DC Vital Battery V and Charger V to Vital Battery Board III.

B.✓ Align 125V DC Vital Battery Bank V and Spare Charger 2-S to Vital Battery Board III.

C. Suspend core alterations on Unit 2 until 125V DC Channel III is returned to OPERABLE status.

D. Restore 125V DC Channel III to OPERABLE status within 1 hour or initiate a shutdown of Unit 1.

<u>*DISTRACTOR ANALYSIS:*</u>

A. Incorrect, Procedure does not allow the alignment of the 125V Vital Battery Charger V when Vital Battery V is aligned to the 125V Vital Battery Boards I, II, III or IV. Plausible because the Vital Battery Charger V is the normal charger used to maintain Vital Battery V, but it is not used when the battery is supplying a Vital Board.

B. CORRECT, 0-SO-250-1 performs the alignment of the 125V Vital Battery Charger V and the 2-S charger to 125V Vital Battery Board III.

C. Incorrect, There is no Tech Spec requirement to suspend Core Alterations due to the loss of the 125V Vital Battery Board III. Plausible because loss of other power sources would cause core alterations to be suspended.

D. Incorrect, Wrong time requirement per Technical Specifications. The LCO requires the board to be restored in 2 hours , not 1 hour. Plausible if the the time requirement is incorrectly applied..

Question No. 14

Tier 1 Group 1

K/A 058 AA1.01
Loss of DC Power: Ability to operate and or monitor the following as they apply to Loss of DC Power: Cross-tie of the affected dc bus with the alternate supply.

Importance Rating: 3.4 / 3.5

Technical Reference: AOP-P.02, Loss of 125v DC Vital Batery Board, Rev 11
0-SO-250-1, 125 Volt DC Vital Power System, Rev 0042

Proposed references to be provided to applicants during examination:
TS pages 3/4 8-11 and 3/4 8-14. (2 pages)

Learning Objective: OPL271AOP-P.02 B.5
Summarize the mitigating strategy for the failure that initiated entry into AOP-P.02

Question Source:
Bank # __X_______
Modified Bank # __________
New ________

Question History: SQN Bank AOP-P.02-B.5 001

Question Cognitive Level:
Memory or fundamental knowledge __X_____
Comprehension or Analysis ______

10 CFR Part 55 Content: (41.7 / 45.5 / 45.6)

10CFR55.43.b (n/a)

Comments: If used as open reference, then the following proposed references are to be provided to applicants during examination: TS pages 3/4 8-11 and 3/4 8-14. (2 total pages)

D.C. DISTRIBUTION - OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.3 The following D.C. vital battery channels shall be energized and OPERABLE:

CHANNEL I Consisting of 125 - volt D.C. board No. I, 125 - volt D.C. battery bank No. I* and a full capacity charger.

CHANNEL II Consisting of 125 - volt D.C. board No. II, 125 - volt D.C. battery bank No. II*, and a full capacity charger.

CHANNEL III Consisting of 125 - volt D.C. board No. III, 125 - volt D.C. battery bank No. III*, and a full capacity charger.

CHANNEL IV Consisting of 125 - volt D.C. board No. IV, 125 - volt D.C. battery bank No. IV*, and a full capacity charger.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one 125-volt D.C. board inoperable, restore the inoperable board to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With one 125-volt D.C. battery bank and/or its charger inoperable, restore the inoperable battery bank and/or charger to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

*D.C. Battery Bank V may be substituted for any other Battery Bank as needed.

ELECTRICAL POWER SYSTEMS

D.C. DISTRIBUTION - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.8.2.4 As a minimum, the following D.C. electrical equipment and boards shall be energized and OPERABLE:

2 - 125-volt D.C. boards either I and III or II and IV, and

2* - 125-volt battery banks and chargers, one associated with each operable D.C. board

APPLICABILITY: MODES 5 and 6.

ACTION:

With less than the above complement of D.C. equipment and board OPERABLE, establish CONTAINMENT INTEGRITY within 8 hours.

SURVEILLANCE REQUIREMENTS

4.8.2.4.1 The above required 125-volt D.C. vital battery boards shall be determined OPERABLE and energized at least once per 7 days by verifying correct breaker alignment and indicated power availability with an overall battery voltage of greater than or equal to 125 volts.

4.8.2.4.2 The above required 125-volt D.C. vital battery banks and chargers sha11 be demonstrated OPERABLE per Surveillance Requirement 4.8.2.3.2.

* D.C. Battery Bank V may be substituted for any other Battery Bank.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2.3 Loss of 125V DC Vital Battery Board III (cont'd)

CAUTION **Significant changes in Aux Bldg pressure may occur due to ventilation dampers failing closed until associated fans are secured.**

14.	**DISPATCH** an Operator to **PERFORM** Appendix M Ventilation and Cooling Shutdown.	
15.	**MONITOR** 125V Vital Battery Board III ready to be ENERGIZED.	**GO TO** Step 19.

NOTE Restoring power from a charger is preferred.

16. **RESTORE** 125V DC Vital Battery Bd III from one of the following **USING** 0-SO-250-1, 125 Volt DC Vital Power System: **[C.1]**

- 125V DC Vital Battery Charger III
- 125V DC Vital Battery Charger 2-S
- 125V DC Battery III
- Spare Vital Battery III with Battery V

Date ________

8.4.4 Vital Battery V aligned to Battery Board III

CAUTION

Tech Spec LCO 3.8.2.1 & 3.8.2.3 will be applicable during performance of step 8.4.4[22] & 8.4.4[23] due to the vital battery board being temporarily disconnected from a vital battery.

NOTES

1) Vital Battery V and the spare charger will be connected to Vital Battery Board III while Vital Battery III is disconnected from the board with Vital Battery Charger III maintaining Vital Battery III charge. The spare charger should remain on equalize voltage to maintain Vital Battery V at its normal charged condition.

2) The system configuration supports TS operability and allows testing of Vital Battery III and Vital Charger III.

[1] **NOTIFY** both unit RO's of alignment to Vital Battery Board III. ☐

[2] **ENSURE** Power Checklist **0-250-1.12** has been completed. ________

[3] **ENSURE** Power Checklist **0-250-1.09** has been performed on spare 125V dc battery chargers. ________

[4] **OPEN** **[0-BKRC-250-KJ/101-S]**, FIFTH VITAL BATT CHRG TO FIFTH VITAL BATT BD, to disconnect Vital Battery Charger V from Vital Battery Board V (Vital Battery Board V, panel 1).

________ 1st

________ CV

[5] **PLACE** **[0-BKRC-250-KJ/201-S]**, FIFTH VITAL BATTERY BD SUPPLY TO DIST PNL A-S, on 125V Vital Battery Board V, panel 2 to the **ON** position to setup feed to Distribution panel A-S.

________ 1st

________ CV

Date ________

8.4.4 Vital Battery V aligned to Battery Board III (continued)

[6] **VERIFY** the following breakers are in the **OFF** position (AB el 749'):

A. **[0-BKRC-250-KX/1-S]**, To Vital Bat Bd III From Spare 125V DC Chgr 2-S XSW

________ 1st

________ CV

B. **[0-BKRC-250-KX/2-S]**, From Vital Bat Bd IV to Spare 125V DC Chgr 2-S XSW

________ 1st

________ CV

C. **[0-BKRA-250-KL/1-S]**, Bkr From 480V SD/BD 2A2-A To Spare 480V AC Vital XSW 2-S

________ 1st

________ CV

D. **[0-BKRA-250-KL/2-S]**, Bkr From 480V SD/BD 2B1-B To Spare 480V AC Vital XSW 2-S

________ 1st

________ CV

E. **[0-BKRC-250-QK/02-S]**, Spare 125v DC Batt Chgr 2-S Output DC Bkr

________ 1st

________ CV

F. **[0-BKRC-250-QK/01-S]**, Spare 125v DC Batt Chgr 2-S Input AC Bkr

________ 1st

________ CV

Date ________

8.4.4 Vital Battery V aligned to Battery Board III (continued)

[7] **IF** **[0-XSW-250-KL-S]**, Spare 480V AC Vital Transfer Switch 2-S, is to be aligned to 480V Shutdown Board 2A2-A, **THEN**

[7.1] **VERIFY** ac potential light is **LIT**. ☐

[7.2] **ENSURE** **[0-BKRA-250-KL/1-S]**, Bkr From 480V SD/BD 2A2-A To Spare 480V AC Vital XSW 2-S, breaker is in the **ON** position.

________ 1st

________ CV

[8] **IF** **[0-XSW-250-KL-S]**, Spare 480V AC Vital Transfer Switch 2-S, is to be aligned to 480V Shutdown Board 2B1-B, **THEN**

[8.1] **CONSULT** Engineering for concurrence and applicability of Tech Specs. ☐

[8.2] **VERIFY** ac potential light is **LIT**. ☐

[8.3] **ENSURE** **[0-BKRA-250-KL/2-S]**, Bkr From 480V SD/BD 2B1-B To Spare 480V AC Vital XSW 2-S, breaker is in the **ON** position.

________ 1st

________ CV

NOTE

Vital Battery V is a 62 cell battery and its normal float voltage is between 136.0 and 142.0 volts; therefore the spare charger must be on equalize voltage control to maintain the battery fully charged.

[9] **ENSURE** timer for equalizing voltage on 2-S spare charger is set to **24 HOUR** position (timer motors are disconnected). ________

[10] **PLACE** **[0-BKRC-250-QK/02-S]**, SPARE 125V DC BATT CHGR 2-S OUTPUT DC BKR on 2-S spare charger cabinet in **ON** position.

________ 1st

________ CV

Date ________

8.4.4 Vital Battery V aligned to Battery Board III (continued)

[11] **PLACE [0-BKRC-250-QK/01-S]**, SPARE 125V DC BATT CHGR 2-S INPUT AC BKR on 2-S spare charger cabinet in **ON** position.

________ 1st

________ CV

[12] **VERIFY** spare charger is energized with output voltage between 131 and 138 volts and stable as indicated on 2-S charger voltmeter. ☐

[13] **PLACE [ALARM DISABLE]** switch on 2-S spare charger cabinet in the **ON** position. ________

NOTE
Located on 2-S Spare 125V Vital Battery Charger 125V DC Transfer Switch on el 749' AB.

[14] **ENSURE [0-BKRC-250-KX/1-S]**, To Vital Bat Bd III From Spare 125V DC Chgr 2-S XSW, breaker is in the **ON** position.

________ 1st

________ CV

NOTE
Annunciator on 1,2-XA-55-1C should alarm when the following step is performed.

[15] **PLACE [0-BKRC-250-KJ/105-S]**, DIST PNL A-S SUPPLY TO 125V VITAL BATT BD III, on Distribution Panel A-S to the **ON** position to align feed to Vital Battery Board III (Located on wall outside Vital Battery Board Rooms, AB el 734').

________ 1st

________ CV

[16] **VERIFY** window B-1 on 1-XA-55-1C and 2-XA-55-1C annunciates. ☐

Date ________

8.4.4 Vital Battery V aligned to Battery Board III (continued)

> **NOTE**
>
> When the normal and spare chargers are in parallel on the battery board one will normally back the voltage of the other down to less than 90 volts, unless their output voltages are perfectly matched.

[17] **PLACE** **[0-BKRC-250-KG/225-F]**, SPARE 125V BATT CHGR 2-S ALT SUPPLY in **ON** position to connect Spare 125V dc Vital Charger to Battery Board III (125V dc Vital Battery Board III, panel 2).

________ 1st

________ CV

[18] **PLACE** **[0-BKRC-250-KG/226-F]**, 125V VITAL BATT CHARGER III NOR SUPPLY in **OFF** position to disconnect Vital Battery Charger III from Battery Board III (125V dc Vital Battery Board III, panel 2).

________ 1st

________ CV

[19] **VERIFY** on Battery Board III **[0-EI-250-KG1-F]**, 125V VITAL CHARGER 2-S VOLTMETER voltage **AND** **[0-EI-250-KG3-F]**, Battery Board III voltmeter stabilizes at 134 to 140 volts. ☐

[20] **VERIFY** Battery III **NOT** discharging on Battery III AMP Meter (125V dc Vital Battery Board III, Panel 1) ☐

[21] **PLACE** ammeter selector switch on battery board in the **ALTERNATE** position to monitor Vital Battery V current (125V dc Vital Battery Board III, Panel 1). ________

Date ________

8.4.4 Vital Battery V aligned to Battery Board III (continued)

CAUTION

Tech Spec LCO 3.8.2.1 & 3.8.2.3 will be applicable during performance of following two steps.

NOTE

System is now set up and ready for battery transfer and charger realignment. Vital Battery V may initially assume the load (~35 amps) due to its higher voltage. Some control room alarms may be received during the transfer process.

Start of Critical Step(s)

[22] **OPEN [0-BCTF-250-KG/107-F]**, 125V VITAL BATTERY III EMERGENCY SUPPLY to disconnect Vital Battery III from Vital Battery Board III (125V dc Vital Battery Board III, panel 1).

_______ 1st

_______ CV

End of Critical Step(s)

NOTE

Breaker **[0-BCTF-250-KG/003-F]** must be hand cranked with the breaker handle to charge the spring for AUTO closure. Should the handle be positioned full up (~135°) the breaker will close in one cycle of the handle. Should the handle be positioned 55 to 90° up, then it will take 2 or 3 cycles of the handle to close the breaker. When in doubt crank the handle until the breaker closes.

[23] **CLOSE [0-BCTF-250-KG/003-F]**, 125V VITAL BATT V PNL A-S DIST SUPPLY, to connect Vital Battery V to Vital Battery Board III (125V dc Vital Battery Board III, panel 0).

_______ 1st

_______ CV

Date ________

8.4.4 Vital Battery V aligned to Battery Board III (continued)

NOTE
Due to differences in calibration and instrument scaling charger voltmeter ranges will be slightly different than the ranges for the charger voltmeters located on the battery boards.

[24] **VERIFY** on Battery Board III **[0-EI-250-KG1-F]**, 125V VITAL CHARGER 2-S VOLTMETER voltage **AND** **[0-EI-250-KG3-F]**, Battery Board III voltmeter stabilizes at 134 to 140 volts. ☐

[25] **SLIDE** mechanical interlock bar to **LEFT** position over breaker **[0-BKRC-250-KG/226-F]**, 125V VITAL BATT CHARGER III NOR SUPPLY (125V Vital Battery Board III, panel 2). ________

[26] **PLACE** **[0-BKRC-250-KG/227-F]**, 125V VITAL BATT CHARGER III ALT SUPPLY in **ON** position to connect Vital Battery Charger III to Vital Battery III (125V Vital Battery Board III, panel 2).

____
1st

____
CV

END OF TEXT

QUESTIONS REPORT
for BANK SQN Questions

AOP-P.02-B.5 001

Given the following plant conditions:

- Unit 1 is at 100% power
- Unit 2 is in Mode 6 with upper internals removal in progress
- 125V DC Vital Battery III Output Breaker tripped and can't be reclosed

Which ONE (1) of the following describes the required actions?

A. Align 125V DC Vital Battery V and Charger V to Vital Battery Board III.

B.✓ Align 125V DC Vital Battery Bank V and Spare Charger 2-S to Vital Battery Board III.

C. Suspend core alterations on Unit 2 until 125V DC Channel III is returned to OPERABLE status.

D. Restore 125V DC Channel III to OPERABLE status within 1 hour or initiate a shutdown of Unit 1.

I. PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: AOP-P.02, LOSS OF 125V DC VITAL BATTERY BOARD

IV. LENGTH OF LESSON/COURSE: 2.0 hour(s)

V. TRAINING OBJECTIVES:

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate *or* explain, using classroom evaluations and/or simulator scenarios, the requirements of AOP-P.02, LOSS OF 125V DC VITAL BATTERY BOARD.

B. Enabling Objectives:

	Objectives
0.	Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with Loss of 125V DC Vital Battery Board that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate position as identified in Appendix A.
1.	State the purpose/goal of AOP-P.02.
2.	Describe the AOP-P.02 entry conditions.
	a. Describe the setpoints, interlocks, and automatic actions associated with AOP-P.02 entry conditions.
	b. Describe the ARP requirements associated with AOP-P.02 entry conditions.
	c. Interpret, prioritize, and verify associated alarms are consistent with AOP-P.02 entry conditions.
	d. Describe the plant parameters that may indicate a Loss of 125V DC Vital Battery Board.
3.	Describe the initial operator response to stabilize the plant upon entry into AOP-P.02.
4.	Upon entry into AOP-P.02, diagnose the applicable condition and transition to the appropriate procedural section for response.
5.	Summarize the mitigating strategy for the failure that initiated entry into AOP-P.02.
6.	Describe the bases for all limits, notes, cautions, and steps of AOP-P.02.
7.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.

15. 062 AK3.03 015

Given the following:

- Unit 1 in service at 90% power for previous 12 hours after running at 100% power for the past 360 days.
- Unit 2 in service at 100% power for 3 days following a refueling outage.
- Spent Fuel Pit cooling is being supplied from Unit 1.

Subsequently:

- All ERCW flow is lost due to an explosion at the ERCW pumping station.
- AOP-M.01, Loss of Essential Raw Cooling Water is implemented on both Units.
- The operators are preparing to establish temporary cooling to a CCP on one of the Units.

Which ONE of the following identifies which Unit should have the CCP temporary cooling established first and the reason why?

	Unit to have CCP temporary Cooling Established First	Reason
A.	Unit 1	Because Unit has higher decay heat due to operating longer.
B.	Unit 1	Because Unit is aligned to supply Spent Fuel Pit cooling
C.✓	Unit 2	Because Unit is NOT aligned to supply Spent Fuel Pit cooling.
D.	Unit 2	Because Unit has higher decay heat since tripped from a higher power level.

<u>*DISTRACTOR ANALYSIS:*</u>

A. Incorrect, Unit 1 being first is not correct and while it would have more decay heat that is not the correct reason. Plausible if the heat up rate is related to the higher decay heat load without relating the effect of the heat sink of the SFP.

B. Incorrect, Unit 1 being first is not correct since having the unit CCS aligned to supply SFP cooling would reduce the heatup rate on the CCS. Plausible if the SFP cooling aligned is viewed as a heat load instead of a heat sink following a loss of all ERCW.

C. CORRECT, Section 2.11 in AOP-M.01, Loss of Essential Raw Cooling Water, directs the installation of the temporary cooling for a CCP on each unit. A caution prior to the step says the CCS for the unit NOT supplying SFP cooling will have a faster heat up rate and establishing the temporary cooling on that unit is more time critical.

D. Incorrect, Unit 2 being first is correct but it is not because the unit was tripped from a higher power level. Plausible because the Unit identified is correct and the heat to be removed is related to being tripped from a higher power level.

Question No. 15

Tier 1 Group 1

K/A 062 AK3.03
Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water:
Guidance actions contained in EOP for Loss of nuclear service water

Importance Rating: 4.0 / 4.2

Technical Reference: AOP-M.01, Loss of Essential Raw Cooling, Rev 19

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271AOP-M.01 B.6
Describe the base for all limits, notes, cautions, and steps of AOP-M.01.

Question Source:
Bank # __________
Modified Bank # __________
New _X_____

Question History: 1/2009 Exam

Question Cognitive Level:
Memory or fundamental knowledge ______
Comprehension or Analysis __X____

10 CFR Part 55 Content: (41.4, 41.8 / 45.7)

10CFR55.43.b (n/a)

Comments:

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2.11 Loss of all ERCW flow (cont'd)

CAUTION 1 Temporary cooling water supply from HPFP to one CCP should be established as soon as possible.

CAUTION 2 CCS for the unit NOT supplying SFP cooling will have a faster heatup rate. Therefore, establishing temporary cooling to a CCP on the unit NOT supplying the SFP is more time critical.

8. **INITIATE** temporary cooling to one CCP and Station Air compressors:

   a. **DETERMINE** which CCP (one per unit) to install temporary cooling water supply.

   b. **DISPATCH** operators to perform Appendix I to align fire protection to supply CCP oil coolers.

   c. **CHECK** cooling water established to station air compressors from Raw Cooling Water.

   RNO c. **IF** RCW has NOT been established to station air compressors, **THEN** **PERFORM** the following:

      1) **DISPATCH** operator to **PLACE** Station Air Compressors in SAFE-STOP.

      2) **DISPATCH** operator and Maintenance to perform App. J, Temporary Cooling to Station Air Compressors.

I. PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: AOP-M.01 LOSS OF ESSENTIAL RAW COOLING WATER

IV. LENGTH OF LESSON/COURSE: 2.0 hour(s)

V. TRAINING OBJECTIVES:

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate or explain, using classroom evaluations and/or simulator scenarios, the requirements of AOP-M.01, LOSS OF ESSENTIAL RAW COOLING WATER

B. Enabling Objectives:

0.	Demonstrate an understanding of NUREG 1122 Knowledge's and Abilities associated with a Loss of Essential Raw Cooling Water that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate license position as identified in Appendix A.
1.	Explain the purpose/goal of AOP-M.01.
2.	Discuss the AOP-M.01 entry conditions. a. Describe the setpoints, interlocks, and automatic actions associated with AOP-M.01 entry conditions. b. Describe the ARP requirements associated with AOP-M.01 entry conditions. c. Interpret, prioritize, and verify associated alarms are consistent with AOP-M.01 entry conditions. d. Describe the Administrative conditions that require Turbine Trip/ Reactor trip due to Loss of Essential Raw Cooling Water.
3.	Describe the initial operator response to stabilize the plant upon entry into AOP-M.01.
4.	Upon entry into AOP-M.01, diagnose the applicable condition and transition to the appropriate procedural section for response.
5.	Summarize the mitigating strategy for the failure that initiated entry into AOP-M.01.
6.	Describe the bases for all limits, notes, cautions, and steps of AOP-M.01.

7.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.
8.	Given a set of initial plant conditions use AOP-M.01 to correctly: a. Recognize entry conditions b. Identify required actions c. Respond to Contingencies d. Observe and Interpret Cautions and Notes
9.	Describe the Tech Spec and TRM actions applicable during the performance of AOP-M.01.
10.	Apply GFE and system response concepts to the abnormal condition – prior to, during and after the abnormal condition

16. 065 AK3.04 016
The reason for the backup air supply for the Turbine Driven AFW Pump LCVs and the action/condition required to align the backup supply is to …

A.✓ allow the LCVs to be CLOSED during a Station Blackout event and will require manual alignment locally when needed.

B. allow the LCVs to be CLOSED during a Station Blackout event and automatically supplied when air pressure drops below regulator setpoint.

C. allow the LCVs to be OPENED during a Station Blackout event and will require manual alignment locally when needed.

D. allow the LCVs to be OPENED during a Station Blackout event and automatically supplied when air pressure drops below regulator setpoint.

DISTRACTOR ANALYSIS:

A. CORRECT, the backup supply is from high pressure air cylinders that allow the valves to be closed a limited number of times after the normal air pressure is lost during a station blackout and its use requires manual valve alignment in accordance with EA-3-4, Local Alignment of TD AFW LCV Backup Air Supply.

B. Incorrect, the backup supply is to allow the valves to be closed during a station blackout where the normal air is lost but it requires a manual valve to be opened to enable its use. Plausible because its purpose is to allow the valve to be closed and there are regulators to maintain pressure to the LCVs at 75 psig when using the backup supply

C. Incorrect, the backup supply is to allow the valves to be closed, not opened,during a station blackout where the normal air is lost. The manual alignment of the supply is correct. Plausible because other AFW LCVs do fail closed and the manual alignment is required to use the backup supply.

D. Incorrect, the backup supply is to allow the valves to be closed, not opened,during a station blackout where the normal air is lost and while there is a regulator, the backup supply is not automatically until it is manually aligned. Plausible because other AFW LCVs do fail closed and there are regulators to maintain pressure to the LCVs at 75 psig when using the backup supply.

Question No. 16

Tier 1 Group 1

K/A 065 AK3.04
Knowledge of the reasons for the following responses as they apply to the Loss of Instrument Air: Cross-over to backup air supplies

Importance Rating: 3.0 / 3.2

Technical Reference: 1,2-47W848-12 R41
EA-3-4, Local Alignment of TD AFW LCV Backup Supply, Rev 4
FSAR amendment 20, Section10.4.7.2.

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.AFW B.4.c & e
Describe the following characteristics of each major component in the AFW system:
c. Support equipment and systems
e. Component operation

Question Source:
Bank # __________
Modified Bank # __________
New _X_____

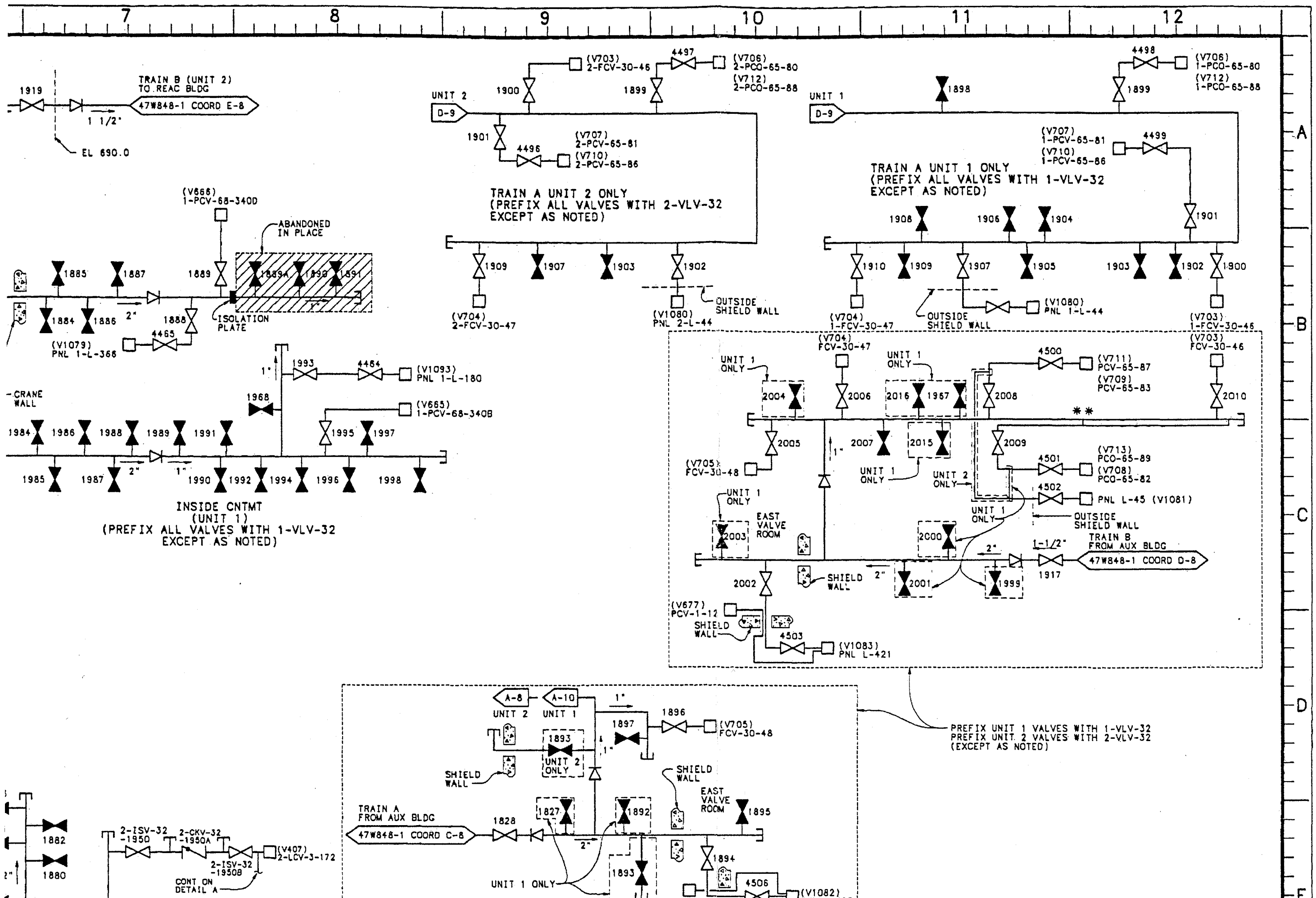
Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge _X_____
Comprehension or Analysis _______

10 CFR Part 55 Content: (41.5,41.10 / 45.6 / 45.13)

10CFR55.43.b (n/a)

Comments: new question for 1/2009 exam



NOTES:

1. SEE SHEET 1 FOR GENERAL NOTES.
2. LINES ARE 1/2" UNLESS NOTED.
3. PIPING CLASSIFICATION-TVA CLASS C.
4. VALVE TAG NUMBERS ARE PREFIXED BY 0-VLV-32 EXCEPT AS NOTED.
5. ALL NORMALLY CLOSED 1/2" VALVES ON THE ESSENTIAL AIR SYSTEM TO BE CAPPED USING MK# 236.
6. SOLENOID VALVES FOR PCV-1-12 AND PCV-1-23 HAVE BEEN RELOCATED TO ANNULUS.
7. SOLENOID VALVE FOR PCV-1-5 AND PCV-1-30 HAVE BEEN RELOCATED TO "480V SHUTDOWN BD ROOM."

ANNULUS AND EAST VALVE ROOM
UNIT 1 SHOWN
UNIT 2 SIMILAR } EXCEPT AS NOTED

** UNIT 1 TAP ONLY

REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
41	ADMIN CHANGE	DGR	JLG	GWL	7-14-06

INC: ADMIN CHANGE PER RIMS: B85 060713 001

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE
UNITS 1 & 2

CATEGORY 1

COMPRESSED AIR SYSTEM FLOW DIAGRAM

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: TF	CHECKER: JWB / EMM	NO ISSUE PER: CCD RECONCILIATION SHEET NO.069. MADE DRAWING A CCD FROM AC-R9-M & AD-R11.	1 MARK L.LAIL
DESIGNER: N/A	REVIEWER: J.E.MADDOX		2 R.E.DANIELS
			3 JOEL D.WEHRMAN

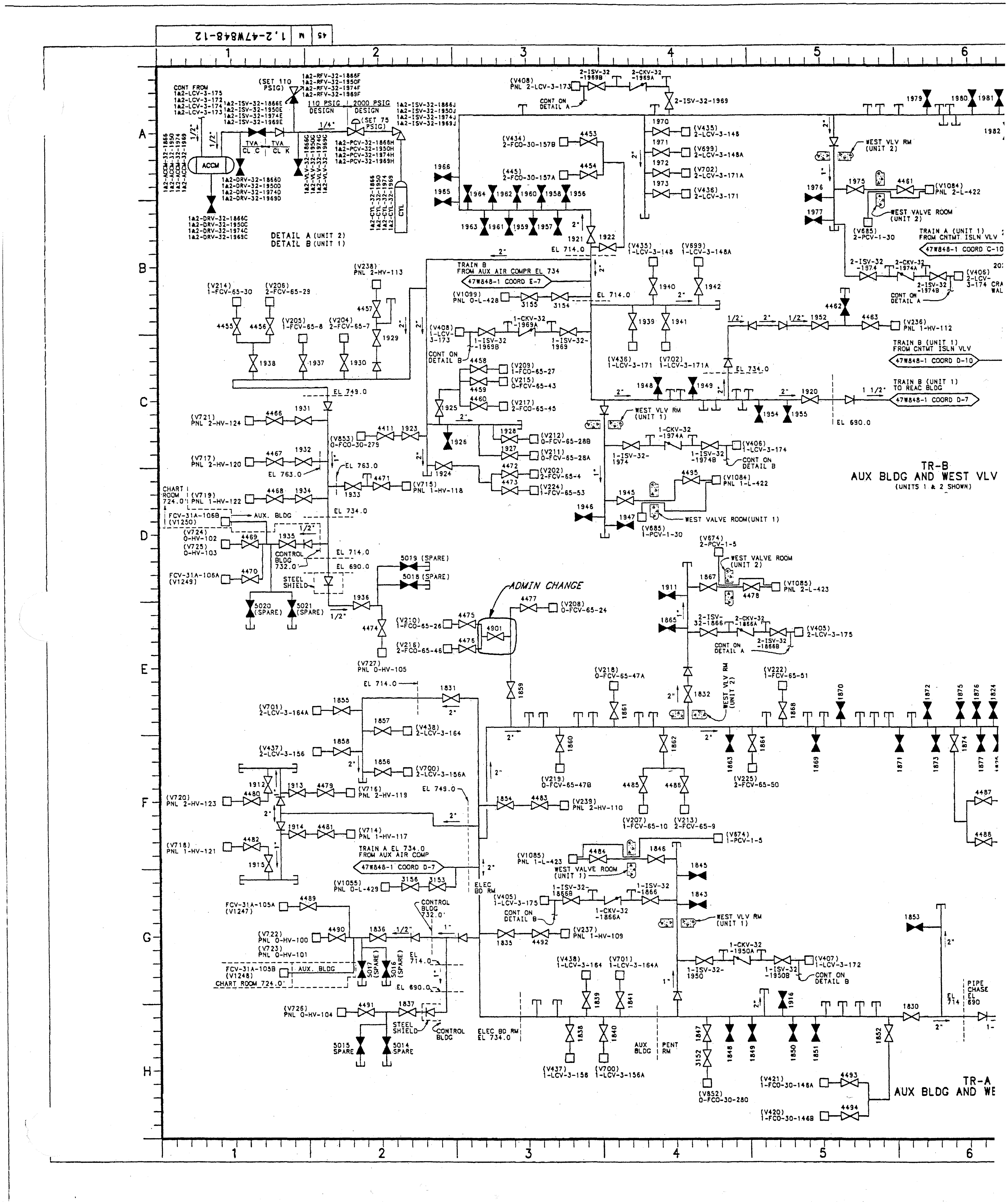
ISSUED BY: J.B.HOSMER

DATE 2-16-88 | 45 | M | CCD NO: 1,2-47W848-12 R41

CAD MAINTAINED DRAWING

CONTROL ROOM DWG

Null



1,2-47W848-12
M
45
DETAIL A (UNIT 2)
DETAIL B (UNIT 1)
ACCM
CYL
110 PSIG DESIGN
2000 PSIG DESIGN
(SET 110 PSIG)
(SET 75 PSIG)
TRAIN B FROM AUX AIR COMPR EL 734
47W848-1 COORD E-7
TRAIN A (UNIT 1) FROM CNTMT ISLN VLV
47W848-1 COORD C-10
TRAIN B (UNIT 1) FROM CNTMT ISLN VLV
47W848-1 COORD D-10
TRAIN B (UNIT 1) TO REAC BLDG
47W848-1 COORD D-7
TR-B
AUX BLDG AND WEST VLV
(UNITS 1 & 2 SHOWN)
ADMIN CHANGE
WEST VALVE ROOM (UNIT 1)
WEST VALVE ROOM (UNIT 2)
WEST VLV RM (UNIT 1)
WEST VLV RM (UNIT 2)
CHART ROOM 724.0'
CONTROL BLDG 732.0'
STEEL SHIELD
TRAIN A EL 734.0 FROM AUX AIR COMP
47W848-1 COORD D-7
ELEC BD RM EL 734.0
AUX BLDG
PENT RM
PIPE CHASE EL 690
TR-A
AUX BLDG AND WE

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT

EOI PROGRAM MANUAL

EMERGENCY ABNORMAL PROCEDURE

EA-3-4

LOCAL ALIGNMENT OF TD AFW LCV BACKUP AIR SUPPLY

Revision 4

QUALITY RELATED

PREPARED/PROOFREAD BY: Marie Hankins

RESPONSIBLE ORGANIZATION: OPERATIONS

APPROVED BY: J.A. DVORAK

EFFECTIVE DATE: 26 May 03

REVISION DESCRIPTION: Revised to add AOP-M.01 to Entry Conditions. Modified steps in section 4.2 and 4.3 to designate steps that should only be performed when procedure is entered for ECA-0.0. This is an intent change.

1.0 Purpose

To provide instructions for operating the high pressure backup air supply to the TD AFW LCVs during a station blackout.

2.0 symptoms and entry conditions

2.1 Entry Conditions

A. ECA-0.0, Loss of All AC Power.

B. AOP-M.01, Loss of Essential Raw Cooling Water.

3.0 Precautions and limitations

3.1 Precautions

A. If the accountability siren sounds, the operator should continue performing this procedure. The SM will remain aware of procedure progression and locations of performing personnel.

4.0 Operator actions

4.1 Section Applicability

1. **IF** placing backup air supply in service,
   THEN
   GO TO Section 4.2. ☐

2. **IF** placing backup air supply in standby,
   THEN
   GO TO Section 4.3. ☐

3. **RETURN TO** procedure and step in effect. ☐

4.2 Placing TD AFW LCV Backup Air Supply in Service

NOTE The high pressure air bottle can provide sufficient air volume and pressure to close the associated TD AFW LCV at least four times.

1. **SELECT** the unit for local alignment of TD AFW LCVs.

   - Unit 1 _____
   - Unit 2 _____

2. **OBTAIN** hand held lighting and radio. ☐

3. **IF** performing this procedure during loss of all AC power (ECA-0.0), **THEN OBTAIN** the following keys:
   [glass-faced box in Shift Manager's Office]

   - Vital Area key ☐
   - Protected Area key. ☐

4. **OPEN** the following backup air supply isolation valves:
   [Aux Bldg, elev 714, Auxiliary Building General Supply Fan Room]

VALVE	DESCRIPTION	OPEN √
ISV-32-1950E	Isolation valve for LCV-3-172	☐
ISV-32-1969E	Isolation valve for LCV-3-173	☐
ISV-32-1866E	Isolation valve for LCV-3-175	☐
ISV-32-1974E	Isolation valve for LCV-3-174	☐

5. **GO TO** Section 4.1, step in effect. ☐

END OF SECTION

4.3 Placing TD AFW LCV Backup Air Supply in Standby

1. **SELECT** the unit for local alignment of TD AFW LCVs.

   - Unit 1 _____
   - Unit 2 _____

2. **OBTAIN** hand held lighting and radio. ☐

3. **IF** performing this procedure during loss of all AC power (ECA-0.0), **THEN** **OBTAIN** the following keys:
   [glass-faced box in Shift Manager's Office]

   - Vital Area key ☐
   - Protected Area key. ☐

4. **WHEN** directed by UO,
   THEN
   CLOSE the following backup air supply isolation valves:
   [Aux Bldg, elev 714, Auxiliary Building General Supply Fan Room]

VALVE	DESCRIPTION	CLOSED √
ISV-32-1950E	Isolation valve for LCV-3-172	☐
ISV-32-1969E	Isolation valve for LCV-3-173	☐
ISV-32-1866E	Isolation valve for LCV-3-175	☐
ISV-32-1974E	Isolation valve for LCV-3-174	☐

5. **CHECK** the pressure in the 4 backup air supply bottles.

   IF any high pressure air bottle supply pressure less than 800 psig,
   THEN
   NOTIFY UO. ☐

6. **GO TO** Section 4.1, step in effect. ☐

END OF TEXT

5.0 References

5.1 Drawings

A. 1, 2-47W803-2, Auxiliary Feedwater System.

B. 1, 2-47W804-1, Condensate System.

C. 1, 2-47W848-12, Control Air System.

remaining effective steam generator(s). The concerns are similar for the main feedwater line rupture as those explained for the loss of main feedwater transients.

Main steamline rupture accident conditions are characterized initially by plant cooldown and, for breaks inside containment, by increasing containment pressure and temperature. Auxiliary feedwater is not needed during the early phase of the transient and flow to the faulted loop will contribute to an excessive release of mass and energy to containment.

Thus, steamline rupture conditions establish the upper limit on auxiliary feedwater flow delivered to a faulted loop. Eventually, however, the RC System will heat up again and auxiliary feedwater flow will be required to be delivered to the unfaulted loop, but at somewhat lower rates than for the loss of feedwater transients described previously. Provisions must be made in the design of the AFW System to limit, control, or terminate the auxiliary feedwater flow to the faulted loop as necessary in order to prevent containment overpressurization following a steamline break inside containment and to ensure the minimum flow to the remaining unfaulted loops.

Loss of All Alternating Current Power (Station Blackout [SBO])

The loss of all alternating current power is postulated as resulting from accident conditions wherein not only onsite and offsite alternating current power is lost but also alternating current emergency power is lost as an assumed common mode failure. Battery power for operation of protection circuits is assumed available. This transient is not evaluated relative to typical criteria listed in Table 10.4.7-1 since multiple failures of safety-grade components or equipment must be assumed; but is considered as a basis for establishing the requirements for providing both an auxiliary feedwater pump power and control source which are not dependent on alternating current power and which are capable of maintaining the plant at hot shutdown until alternating current power is restored.

During a SBO, main feedwater flow to the SGs is terminated as a result of the main feedwater pumps tripping and feedwater regulating valves closing (loss of AC power). The transient is identical to a "Loss of Main Feedwater Transient with LOOP" in which one motor-driven auxiliary feedwater pump (MDAFWP) is needed to provide sufficient cooling water flow to two SGs. The turbine-driven auxiliary feedwater pump (TDAFWP) has a greater flow capacity than one MDAFWP and is capable of supplying all four SGs. The AFW system is actuated on a SBO and the TDAFWP is relied upon to provide sufficient cooling/SG level during the four hours SBO. The SG level can be maintained by controlling TDAFWP speed and by closing the TDAFWP LCVs (if required) using available air from accumulator tank and high pressure air cylinder. On loss of air, the TDAFWP LCVs will fail open.

Loss-of-Coolant Accident (LOCA)

The large break loss-of-coolant accident does not impose AFW System flow requirements above those required by the other accidents addressed in this section.

Small break LOCA's are characterized by relatively slow rates of decrease in RC System pressure and liquid volume. The principal contribution from the AFW System following such small break LOCA's is basically the same as the system's function during hot shutdown or following spurious safety injection signal which trips the reactor. Maintaining a water level inventory in

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** AUXILIARY FEEDWATER

IV. **LENGTH OF LESSON:** 3 hour lecture; 1.0 hour simulator demonstration; 4 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Auxiliary Feedwater (AFW) system in the plant and on the simulator.

B. Learning Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge and abilities associated with the AFW system that are rated $\geq$ 2.5 during Initial License Training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the AFW system as described in the FSAR.
2. State the design basis of the AFW system in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the AFW system as illustrated on a simplified system drawing.
4. Describe the following characteristics of each major component in the AFW system:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the AFW system components are designed
   m. Location of controls and indications associated with the AFW system in the control room and auxiliary control room

Auxiliary Feedwater Components

- TDAFW Pump Level Control Valve
  - Emergency Operations
    - Each valve is equipped with an emergency high pressure air supply (1.5 cubic ft bottles charged to 2000 psig) which is manually aligned when needed for emergency air supply.
    - Emergency air supply is designed to provide 22 close strokes from 2000 psig and 4 close strokes after pressure reaches 800 psig (based on an estimated 4 strokes/hr for 4 hrs)
    - EA-3-4 provides guidance for aligning the backup air supply.

EO 3

X. **LESSON BODY**:

Calculated values show that the actual capacity will allow approximately 13 strokes from 1000 psig and 4 strokes from 500 psig.

A spare bottle has been provided.

Valve actuators are low air usage actuator and has a handwheel for local emergency dogging the valves closed.

17. 077 AA1.03 017
Given the following:

- Unit 1 is at 100% RTP.
- All systems are aligned normally.
- Generator reactive load is currently at "0" MVARs.
- The Transmisson Operator has notified the plant that system voltage problems require Unit 1 to establish the maximum allowable outgoing reactive load.

Which ONE of the following identifies the MAXIMUM outgoing reactive load in accordance with GOI-6, "Apparatus Operation", and the correct operation of the Exciter Voltage Adjuster?

	Maximum Outgoing Reactive Load	**Exciter Voltage Adjuster**
A.	240 MVARs	Lower
B.✓	240 MVARs	Raise
C.	300 MVARs	Lower
D.	300 MVARs	Raise

DISTRACTOR ANALYSIS:

A. Incorrect, 240 MVARs is maximum outgoing in accordance with GOI-6 but the voltage adjuster would be moved to the Raise direction to establish the maximum outgoing. Plausible because 240 is the correct MVAR limit. Moving the voltage adjuster in the Lower direction would increase MVARs and would be the direction used to establish the maximum incoming MVARs.

B. CORRECT, 240 MVARs is maximum outgoing in accordance with GOI-6 and the voltage adjuster would be moved in the Raise direction to establish the maximum outgoing MVARS.

C. Incorrect, Plausible because 300 is the correct MVAR limit for incoming MVARs. Moving the voltage adjuster in the Lower direction would increase MVARs and would be the direction used to establish the maximum incoming MVARs.

D. Incorrect, Plausible because 300 is the correct MVAR limit for incoming MVARs. Moving the voltage adjuster in the Raise direction would increase MVARs and would be the direction used to establish the maximum outgoing MVARs.

Question No. 17

Tier 1 Group 1

K/A 077 AA1.03
Ability to operate and/or monitor the following as they apply to Generator Voltage and Electric Grid Disturbances: Voltage Regulator controls

Importance Rating: 3.8 / 3.7

Technical Reference: GOI-6, Apparatus Operations, Rev 126, Appendix E

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200GEN B.4.d, .e & .f
Describe the following characteristics of each component in the Main Generator:
d. Normal operating parameters
e. Component operation
f. Controls

Question Source:
Bank # __________
Modified Bank # __X______
New _______

Question History: WBN question 000077 G2.1.20

Question Cognitive Level:
Memory or fundamental knowledge ______
Comprehension or Analysis __X___

10 CFR Part 55 Content: (41.5 and 41.10 / 43.5 / 43.7 / 45.18)

10CFR55.43.b (n/a)

Comments:

Question Number: 18

K/A: 000077 G2.1.20
Generator Voltage and Electric Grid Disturbances
Ability to interpret and execute procedure steps.

Tier:	1	**RO Imp:**	**4.6**	**RO Exam:**	**Yes**	**Cognitive Level:**	**LOW**
Group:	1	**SRO Imp:**	**4.6**	**SRO Exam:**	**Yes**	**Source:**	**NEW**

Applicable 10CFR55 Section: 41.10/43.5/45.12

Learning Objective: 3-OT-SYS057A, Objective 14: Describe the generator Capability Curve, and how it is used; Objective 15 Discuss how generator excitation affects reactive load.

References: TI-12.15, Rev. 22; 1-PI-OPS-1-MCR, Section 5.4, (Monitoring Generator Loading), Rev. 39.

Question:

Given the following conditions:

- Plant is at 100% power.
- All systems normally aligned.
- The Transmission Operator has notified the plant that system grid voltage is high and forecasted to go higher.

If the Transmission Operator requests the plant to take in the maximum value of MVARs to help stabilize the grid, what is the maximum allowed MVAR incoming value, and how is the adjustment made in accordance with 1-PI-OPS-1-MCR, Main Control Room?

	MAX INCOMING VALUE	METHOD OF ADJUSTMENT
A.	100 MVARs	Exciter Voltage Adjuster
B.	100 MVARs	Exciter Base Adjuster
C.	200 MVARs	Exciter Voltage Adjuster
D.	200 MVARs	Exciter Base Adjuster

DISTRACTOR ANALYSIS

a. CORRECT. The first step of 1-PI-OPS-1-MCR, Section 5.4 for Monitoring Generator Loading, specifies the Exciter Voltage Adjuster as the means for voltage control on the Northeast Area Dispatcher (NEAD) schedule. In the next step, incoming Mvar loading is restricted to less than 100 Mvars.

b. Incorrect. Candidate correctly recognizes the lower limit on Mvars in, but incorrectly believes the base adjuster is the procedurally specified method of making the adjustment. Plausible, since use of the base adjuster is allowed, but ONLY if you are already selected to the base adjuster. The conditions in the stem, "all systems normally aligned", requires the candidate to understand that the Exciter Voltage Adjuster is the selected method.

c. Incorrect. Candidate fails to recall that 200 Mvars is twice the allowed value for Mvars in, per the procedure. The correct value is - 100 Mvars. This distractor is plausible since the Exciter Voltage Adjuster is the specified method of making vars adjustments for the given conditions.

d. Incorrect. Candidate fails to recall that 200 Mvars is twice the allowed value for vars in, per the procedure. The correct value is - 100 Mvars. Distractor is plausible since the Exciter Base Adjuster is the correct method, but ONLY if you are already selected to the base adjuster. The conditions in the stem, "all systems normally aligned", requires the candidate to understand that the Exciter Voltage Adjuster is the selected method.

3.0 MVAR LIMITS FOR GENERATOR STABILITY (REFERENCE USE)

NOTE Operation of main generator without automatic voltage control could impact grid voltage requirements. SELD should be notified immediately if automatic voltage regulator is lost.

Studies show that there is some risk of instability in the event of a fault at high side of SQN 500/161kV Intertie Transformer Bank plus a failure of a high side breaker to clear. Backup breakers would then take the entire 500kV bus section out of service. <u>This double-fault event is not postulated to occur simultaneously with a LOCA</u> and is therefore not a scenario used to determine nuclear offsite power adequacy. This is an issue related to grid reliability only and operating guidelines to ensure stability are included in this document for convenience.

SQN Units 1 and 2 must observe generation limits under certain grid conditions in order to ensure stability under the above double-fault scenario.

Both Units are limited to a **Maximum Outgoing Reactive Load of 240 Mvar**. This limitation supports offsite power source qualification.

Transmission Reliability Organization's SQN Grid Operating Guide directs that the Transmission Operator will notify the SQN Generator Operator of any Mvar Limits recommended. Grid stabilization following the loss of an element depends on the coordination of multiple changes including SQN reactive loading. Real time information on the factors affecting grid stability is not available to SQN Operators, therefore the Transmission Operator will coordinate the effort. The limits provided in the following tables are for information only.

3.1 MVAR LIMITS FOR UNIT 1 GENERATOR STABILITY (REFERENCE USE)

CAUTION **Adjustment of reactive loading during abnormal grid conditions or with multiple elements out of service should be coordinated with Transmission Operator.**

NOTE Unit One has a 240 Mvar outgoing limit to support off site power source qualification.

Observe the following limits on SQN Unit 1 reactive power:

Element Out of Service	Mvar Limit with Exciter in Automatic Mode	Mvar Limit with Exciter in Manual Mode
SQN - Bradley Line	maximum 150 Mvar INCOMING (less negative than -150Mvar)	maximum 100 Mvar INCOMING (less negative than -100Mvar)
Bradley Line - Bowen	maximum 150 Mvar INCOMING (less negative than -150Mvar)	maximum 50 Mvar INCOMING (less negative than -50Mvar)
SQN - Widows Creek	maximum 300 Mvar INCOMING (less negative than -300Mvar)	maximum 200 Mvar INCOMING (less negative than -200Mvar)
SQN - Franklin	maximum 300 Mvar INCOMING (less negative than -300Mvar)	maximum 250 Mvar INCOMING (less negative than -250Mvar)
Any other 500kV Transmission Line out of service	maximum 300 Mvar INCOMING (less negative than -300 Mvars)	maximum 300 Mvar INCOMING (less negative than -300 Mvar)
No 500kV Transmission Line out of service	maximum 300 Mvar INCOMING (less negative than -300 Mvar)	maximum 300 Mvar INCOMING (less negative than -300 Mvar)

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** MAIN GENERATOR

IV. **LENGTH OF LESSON:** 24 hour lecture; 4 hour simulator demonstration; 10 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Main Generator in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with the Main Generator as identified in Appendix A.
1. State the purpose/functions of the Main Generator as described in the SQN FSAR.
2. State the design basis of the Main Generator in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the Main Generator as illustrated on a simplified system drawing.
4. Describe the following characteristics of each major component in the Main Generator:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the components are designed
   m. Location of controls and indications in the control room and auxiliary control room

V. **TRAINING OBJECTIVES (Cont'd):**

B. Enabling Objectives (Cont'd):

5. Describe the operation of the Main Generator:
    a. Precautions and limitations
    b. Major steps performed while placing the system in service
    c. Alarms and alarm response
    d. How a component failure will affect system operation
    e. How a support system failure will affect system operation
    f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the Main Generator:
    a. State Tech Specs/TRM LCOs that govern the Main Generator.
    b. State the ≤1 hour action limit TS LCOs
    c. Given the conditions/status of the Main Generator components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events

VI. **TRAINING AIDS:**

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)

18. W/E11 EK2.1 018

Given the following conditions:

- With Unit 1 initally at full power a large break LOCA occurred.
- Containment pressure = 11 psig.
- RWST level = 26%.
- Containment Sump level = 12%.
- RHR transfer to the Containment sump could NOT be performed.
- The crew transitioned to ECA-1.1, "Loss Of RHR Sump Recirculation", and is at Step 8 to determine the proper containment spray pump alignment and operation.

Which ONE of the following will result in the proper alignment of the containment spray pumps under existing plant conditions?

A. Stop both containment spray pumps and place the handswitches in PULL TO LOCK.

B. Continue to run both containment spray pumps until RWST level is less than or equal to 8%, then stop one pump.

C.✓ Stop one containment spray pump and allow the remaining pump to take suction from the RWST.

D. Stop both containment spray pumps until suction can be aligned to the containment sump, then restart one pump.

<u>DISTRACTOR ANALYSIS</u>:

A. Incorrect, ECA-1.1 conserves inventory and requires going down to one Spray pump with current plant conditions. Having at least one spray pump is required due to containment pressure. Plausible because both pumps would be stopped and placed in pull-to-lock if containment pressure had been less than 9.5 psig.

B. Incorrect, ECA-1.1 conserves inventory and requires going down to one Spray pump with current plant conditions. Plausible because both pumps would be left running if containment pressure had been greater than 12.0 psig and both would be stopped if RWST level dropped to 8%.

C. CORRECT, Stop one Containment Spray pump and allow the remaining pump to take suction from the RWST.

D. Incorrect, Having at least one spray pump in operation is required due to containment pressure. Plausible because the pumps would be restarted if they were required after the containment sump level increased to 22%.

Question No. 18

Tier 1 Group 1

K/A W/E11 EK2.1
E11 Loss of Emergency Coolant Recirculation
Knowledge of the interrelations between the (Loss of Emergency Coolant Recirculation) and the following:
Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Importance Rating: 3.6 / 3.9

Technical Reference: ECA-1.1, Loss of RHR Sump Recirculation, Rev 11.

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271ECA1-1 B.6.a
Given a set of initial plant conditions use ECA-1.1 to correctly:
a. Identify required actions

Question Source:
Bank # __X_______
Modified Bank # __________
New ________

Question History: WBN bank

Question Cognitive Level:
Memory or fundamental knowledge ________
Comprehension or Analysis _X_____

10 CFR Part 55 Content: (41.7 / 45.7)

10CFR55.43.b (n/a)

Comments: Question from WBN bank with slight adjustment to numbers to fit SQN

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

8. **DETERMINE** containment spray requirements:

a. **CHECK** containment spray pump suction ALIGNED to RWST.

a. **IF** containment spray pump suction aligned to sump, **THEN** **GO TO** Step 10.

b. **DETERMINE** number of spray pumps required from table below:

RWST LEVEL (%)	CONTAINMENT PRESSURE (PSIG)	NUMBER OF CONTAINMENT SPRAY PUMPS REQUIRED
Greater than 8	Greater than 12.0	2
	Between 9.5 and 12.0	1
	Less than 9.5	0
Less than 8	--------	0

c. **CHECK** number of spray pumps running equal to number required.

c. **START** or **STOP** containment spray pumps to establish required number of running pumps.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9.	**MONITOR** if containment spray should be aligned for sump recirculation:	
	a. **CHECK** the following: • Any containment spray pump RUNNING • Containment sump level greater than 18% [22% ADV] • At least one containment sump valve FCV-63-72 or FCV-63-73 OPEN or capable of opening.	a. **IF** containment pressure is greater than 2.81 psig **THEN** **NOTIFY** TSC to evaluate restoring normal containment cooling **USING** EA-30-4, Restoring Containment Coolers. **GO TO** Step 10.
	b. **STOP** containment spray pumps and **PLACE** in PULL TO LOCK	
	c. **CLOSE** containment spray suction from RWST valves: • FCV-72-22 Train A • FCV-72-21 Train B.	
	d. **ENSURE** Train A containment sump valve FCV-63-72 OPEN.	d. **GO TO** Substep 9.g.
	e. **ENSURE** Train A RHR suction valve FCV-74-3 CLOSED.	
	f. **OPEN** Train A cntmt spray suction from containment sump valve FCV-72-23.	f. **ENSURE** FCV-72-22 and FCV-74-3 CLOSED to satisfy interlocks. **ATTEMPT** to open FCV-72-23.

(step continued on next page)

I. PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: EMERGENCY OPERATING PROCEDURE ECA-1.1, "Loss of RHR Sump Recirculation"

IV. LENGTH OF LESSON/COURSE: 1 hour(s)

V. TRAINING OBJECTIVES:

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate or explain, using classroom evaluations and/or simulator scenarios, the requirements of ECA-1.1, "Loss of RHR Sump Recirculation"

B. Enabling Objectives:

B. Enabling Objectives:

0.	Demonstrate an understanding of NUREG 1122 Knowledge's and Abilities associated with Loss of RHR Sump Recirculation that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate license position as identified in Appendix A.
1.	Explain the purpose/goal of ECA-1.1.
2.	Discuss the ECA-1.1 entry conditions. a. Describe the setpoints, interlocks, and automatic actions associated with ECA-1.1 entry conditions. b. Describe the requirements associated with ECA-1.1 entry conditions.
3.	Summarize the mitigating strategy for the failure that initiated entry into ECA-1.1.
4.	Describe the bases for all limits, notes, cautions, and steps of ECA-1.1.
5.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.
6.	Given a set of initial plant conditions use ECA-1.1 to correctly: a. Identify required actions b. Respond to Contingencies c. Observe and Interpret Cautions and Notes
7.	Apply GFE and system response concepts to the performance of ECA-1.1 conditions.

19. 001 AK3.02 019

Given the following:

- Unit 1 is operating near EOL at 80% power.
- Rod control is in AUTOMATIC with Control Bank "D" at 186 steps.
- 1-PT-1-73, Turbine Impulse Pressure Transmitter fails HIGH.

Which ONE of the following identifies the direction Control Bank "D" rods will move and why the Rod Position Indicating (RPI) System Technical Specification requires the individual rod RPIs to be ± 12 steps of the respective group step counter?

	Direction	**T/S Requirement to be ± 12 steps of Step Counter**
A.	Insert	To maintain acceptable power distribution limits.
B.	Insert	To ensure moderator temperature coefficient remains negative.
C.✓	Withdraw	To maintain acceptable power distribution limits.
D.	Withdraw	To ensure moderator temperature coefficient remains negative.

<u>*DISTRACTOR ANALYSIS:*</u>

A. Incorrect, the rods would withdraw instead of insert but the reason for the alignment requirement being to maintain acceptable power distribution limits is correct. Plausible because the failure could be reversed to cause the insertion of rods and a reason for the alignment requirement is to maintain acceptable power distribution limits

B. Incorrect, the rods would withdraw instead of insert and a reason for the alignment requirement is to maintain acceptable power distribution limits, not to prevent MTC form becoming positive. Plausible because the failure could be reversed to cause the insertion of rods and T/Ss do require establishing rod withdrawal limits to prevent having a positive MTC under different conditions.

C. CORRECT, If the Turbine impulse pressure transmitter fails high, there will be a large error between rate of turbine power change and the rate of reactor power change which causes the rods to withdraw along with the Tref - Tavg program indicating Tref much higher than Tavg. The Tech. Spec. requires the RPI and the reason for the alignment requirement is to maintain acceptable power distribution limits.

D. Incorrect, the rods would withdraw, but the reason for the alignment requirement is to maintain acceptable power distribution limits, not to prevent MTC form becoming positive. Plausible because the rods would withdraw and T/Ss do require establishing rod withdrawal limits to prevent having a positive MTC under different conditions.

Question No. 19

Tier 1 Group 2

K/A 001 AK3.02
Knowledge of the reasons for the following responses as they apply to the Continuous Rod Withdrawal : Tech-Spec limits on rod operability

Importance Rating: 3.2 / 4.3

Technical Reference: Tech Spec 3.1.3.2 Amendment 315
Tech Spec 3.1.1.3 Amendment 276

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.RCDNT B.5.d
Describe the operation of the Rod Control System as it relates to the following:
d. How a component failure will effect system operation.

Question Source:
Bank # __________
Modified Bank # _________
New _X_____

Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge _______
Comprehension or Analysis _X_____

10 CFR Part 55 Content: (41.5,41.10 / 45.6 / 45.13)

10CFR55.43.b (n/a)

Comments: New for SQN Exam 1/2009

LIMITING CONDITION FOR OPERATION

3.1.1.3 The moderator temperature coefficient (MTC) shall be within the limits specified in the COLR. The maximum upper limit shall be less than 0 delta k/k/°F.

APPLICABILITY: Beginning of cycle life (BOL) limit - MODES 1 and 2* only#
End of life cycle (EOL) limit - MODES 1, 2 and 3 only#

ACTION:

a. With the MTC more positive than the BOL limit specified in the COLR operation in MODES 1 and 2 may proceed provided:

   1. Control rod withdrawal limits are established and maintained sufficient to restore the MTC to less positive than the BOL limit specified in the COLR within 24 hours or be in HOT STANDBY within the next 6 hours. These withdrawal limits shall be in addition to the insertion limits of Specification 3.1.3.6.

   2. The control rods are maintained within the withdrawal limits established above until a subsequent calculation verifies that the MTC has been restored to within its limit for the all rods withdrawn condition.

b. With the MTC more negative than the EOL limit specified in the COLR, be in HOT SHUTDOWN within 12 hours.

*With K_{eff} greater than or equal to 1.0

#See Special Test Exception 3.10.3

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section ensure that (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) limit the potential effects of rod misalignment on associated accident analyses. OPERABILITY of the control rod position indicators is required to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits.

Limiting Condition for Operation 3.1.3.2, Actions a.2.a) and a.2.b) contain provisions to perform reviews of the rod control system parameters for indications of unintended rod movement and provisions to determine rod position with the moveable incore detectors should unintended movement be detected. These actions support alternate rod position monitoring for a single rod that has an inoperable rod position indicator. The rod banks may be automatically controlled from input signals generated by the reactor control system or by manual means controlled by the unit operator. These types of rod movement are intentional and do not represent unintentional rod movement. A software algorithm within the plant computer will monitor stationary gripper and lift coil signals for the inoperable rod indication and compare these to manual or automatic demand signals for rod motion. If these coil signals do not properly match the demand signal, the computer will generate an alarm indicating unintended rod movement. Unintended rod movement includes rod stepping in the wrong direction, rod stepping without demand (includes loss of stationary gripper signal indicating possible rod slip or drop), and alternate rod position monitoring failure. Once a valid alarm is received, Action a.2.a) is applicable and the position of the rod will have to be determined within 8 hours of the alarm by use of the incore detectors. In addition, the computer alarm may be accompanied by a rod control system urgent alarm which is annunciated in the MCR.

Limiting Condition for Operation 3.1.3.2, Action a.2 footnote contains limitations for the use of this action. These limitations include the restriction that the alternate monitoring can only be used for one inoperable rod position indicator and that this provision can only be used until the first opportunity to repair the indicator. This would include the refueling outage at the end of the fuel cycle or a forced outage that required entry into Mode 5 for a sufficient duration to safely perform the repair. Sufficient duration takes into consideration the duration that other activities associated with the forced outage require to return the unit to service. The actual repair and activities to repair the indicator may not be known until evaluations can be performed in Mode 5 when access to the head is possible. If the repair activities require more time than planned for the other outage activities, the unit may be returned to service without completing the rod position indication repair and the alternate monitoring can continue to be utilized. However, if reasonable efforts can be performed to repair the indication within the planned outage duration, the alternate monitoring provisions of Action a.2 cannot be utilized for continued power operation of the unit. In no case may the alternate monitoring provisions of Action a.2 be allowed to continue following a refueling outage for the same problem that was identified prior to that refueling outage.

POSITION INDICATION SYSTEMS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.3.2 The shutdown and control rod position indication system and the demand position indication system shall be OPERABLE and capable of determining the control rod positions within ± 12 steps.

APPLICABILITY: MODES 1 and 2.

ACTION:

a. With a maximum of one rod position indicator per bank inoperable either:

   1. Determine the position of the non-indicating rod(s) indirectly by the movable incore detectors at least once per 12 hours and immediately after any motion of the non-indicating rod which exceeds 24 steps in one direction since the last determination of the rod's position, or

   2.* a) Determine the position of the non-indicating rod indirectly by the movable incore detectors within 8 hours and once every 31 days thereafter and within 8 hours if rod control system parameters indicate unintended movement, and

   b) Review the parameters of the rod control system for indications of unintended rod movement for the rod with an inoperable position indicator within 16 hours and once per 8 hours thereafter, and

   c) Determine the position of the non-indicating rod indirectly by the movable incore detectors within 8 hours if the rod with an inoperable position indicator is moved greater than 12 steps and prior to increasing THERMAL POWER above 50% RATED THERMAL POWER and within 8 hours of reaching 100% RATED THERMAL POWER, or

   3. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.

b. With more than one rod position indicator per bank inoperable either:

   1. Determine the position of the non-indicating rod(s) indirectly by the movable incore detectors at least once per 12 hours, and immediately after any motion of the non-indicating rod which exceeds 24 steps in one direction since the last determination of the rod's position, and

---

* Rod position monitoring by Actions 2.a), 2.b), and 2.c) may only be applied to one inoperable rod position indicator and shall only be allowed: (1) until the end of the current cycle, or (2) until an entry into MODE 5 of sufficient duration, whichever occurs first, when the repair of the inoperable rod position indication can safely be performed. Actions 2.a), 2.b), and 2.c) shall not be allowed after the plant has been in MODE 5 or other plant condition, for a sufficient period of time, in which the repair of the inoperable rod position indication could have safely been performed.

2. Place the control rods under manual control, and monitor and record Reactor Coolant System average temperature (T_{avg}) at least once per hour, and

3. Restore the rod position indicators to OPERABLE status within 24 hours such that a maximum of one rod position indicator per bank is inoperable, or

4. Be in HOT STANDBY within the next 6 hours.

c. With a maximum of one demand position indicator per bank inoperable either:

1. Verify that all rod position indicators for the affected bank are OPERABLE and that the most withdrawn rod and the least withdrawn rod of the bank are within a maximum of 12 steps of each other at least once per 12 hours, or

2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.2 Each rod position indicator shall be determined to be OPERABLE by verifying that the demand position indication system and the rod position indication system agree within 12 steps at least once per 12 hours except during time intervals when the Rod Position Deviation Monitor is inoperable, then compare the demand position indication system and the rod position indication system at least once per 4 hours.

The control rod insertion limits and shutdown rod insertion limits are specified in the COLR per Specification 6.9.1.14.

The ACTION statements which permit limited variations from the basic requirements are accompanied by additional restrictions which ensure that the original design criteria are met. Misalignment of a rod requires measurement of peaking factors and a restriction in THERMAL POWER. These restrictions provide assurance of fuel rod integrity during continued operation. In addition, those accident analyses affected by a misaligned rod are reevaluated to confirm that the results remain valid during future operation.

In the event that a malfunction of the Rod Control System renders control rods immovable, provision is made for continued operation provided:

- o The affected control rods remain trippable, and
- o The individual control rod alignment limits are met.

In the event that a malfunction of the Rod Control System renders control rod banks immovable during surveillance testing, provision is made for 72 hours of continued operation provided:

- o The affected control rod banks remains trippable,
- o The individual control rod alignment limits are met,
- o A maximum of one control or shutdown bank is inserted no more than 18 steps below the insertion limit,
- o No reactor coolant system boron concentration dilution activities or power level increases are allowed, and
- o The SHUTDOWN MARGIN requirements are verified every 12 hours or upon insertion of controlling bank during the period the insertion limit is not met.

The requirements to preclude Reactor Coolant System boron concentration dilution, while a control or shutdown bank is below insert limits, will minimize the impact on shutdown margin.

The controlling bank(s), which is normally Control Bank D, is excluded from the 72-hour provision since insertion of this bank(s) below the insertion limit is not required for control rod assembly surveillance testing. A controlling bank is defined as any control bank that is less than fully withdrawn as defined in the COLR with the exception of fully withdrawn banks that have been inserted in accordance with Surveillance Requirement 4.1.3.1.2. This provision excludes the use of the 72-hour allowance for control banks that can be exercised 10 steps in either direction without exceeding the insertion limits.

Checks are performed for each reload core to ensure that bank insertions of up to 18 steps will not result in power distributions, which violate the DNB criterion for ANS Condition II transients (moderate frequency transients analyzed in Section 15.2 of the UFSAR). Administrative requirements on the initial controlling bank position will ensure that this insertion and an additional controlling bank insertion of five steps or less will not violate the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 during the repair period. If the controlling bank is inserted more than five steps deeper than its initial position, a calculation will be performed to ensure that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is met. Since no dilution or power level increases are allowed, shutdown margin will be maintained as long as the controlling bank is far enough above its insertion limit to compensate for the inserted worth of the bank that is beyond its insertion limit.

The 72-hour period for a control rod assembly bank to be inserted below its insertion limit restricts the likelihood of a more severe (i.e., ANS Condition III or IV) accident or transient condition occurring concurrently with the insertion limit violation.

The maximum rod drop time restriction is consistent with the assumed rod drop time used in the accident analyses. Measurement with T_{avg} greater than or equal to 541°F and with all reactor coolant pumps operating ensures that the measured drop times will be representative of insertion times experienced during a reactor trip at operating conditions.

Control rod positions and OPERABILITY of the rod position indicators are required to be verified on a nominal basis of once per 12 hours with more frequent verifications required if an automatic monitoring channel is inoperable. These verification frequencies are adequate for assuring that the applicable LCO's are satisfied.

3/4.1.3.4 ROD DROP TIME and 3/4.1.3.5 SHUTDOWN ROD INSERTION LIMIT

Fully withdrawn for shutdown and control rod banks is defined as a condition where the rod banks are positioned in a range of 222 to 231 steps fully withdrawn. This range is defined to permit axial repositioning of rod banks to mitigate rod wear on internal guide surfaces.

SURVEILLANCE REQUIREMENTS

4.1.1.3 The MTC shall be determined to be within its limits during each fuel cycle as follows:

a. The MTC shall be measured and compared to the BOL limit specified in the COLR prior to initial operation above 5% of RATED THERMAL POWER, after each fuel loading.

b. The MTC shall be measured at any THERMAL POWER and compared to the 300 PPM surveillance limit specified in the COLR (all rods withdrawn, RATED THERMAL POWER condition) within 7 EFPD after reaching an equilibrium boron concentration of 300 ppm. In the event this comparison indicates that MTC is more negative than the 300 ppm surveillance limit specified in the COLR, the MTC shall be remeasured and compared to the EOL MTC limit specified in the COLR at least once per 14 EFPD during the remainder of the fuel cycle.

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** ROD CONTROL SYSTEM (RDCNT)

IV. **LENGTH OF LESSON:** 2 hour lecture; 1 hour simulator demonstration; 1 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Rod Control system in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge and abilities associated with the Rod Control System that are rated $\geq$ 2.5 during Initial License training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the Rod Control System as described in the SQN FSAR.
2. State the design basis of the Rod Control System in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the Rod Control System as illustrated on the simplified system drawing.
4. Describe the following items for each major component in the Rod Control System as described in this lesson:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the Rod Control System components are designed
   m. Location of controls and indications associated with the Rod Control System in the control room and auxiliary control room

V. **TRAINING OBJECTIVES (Cont'd):**

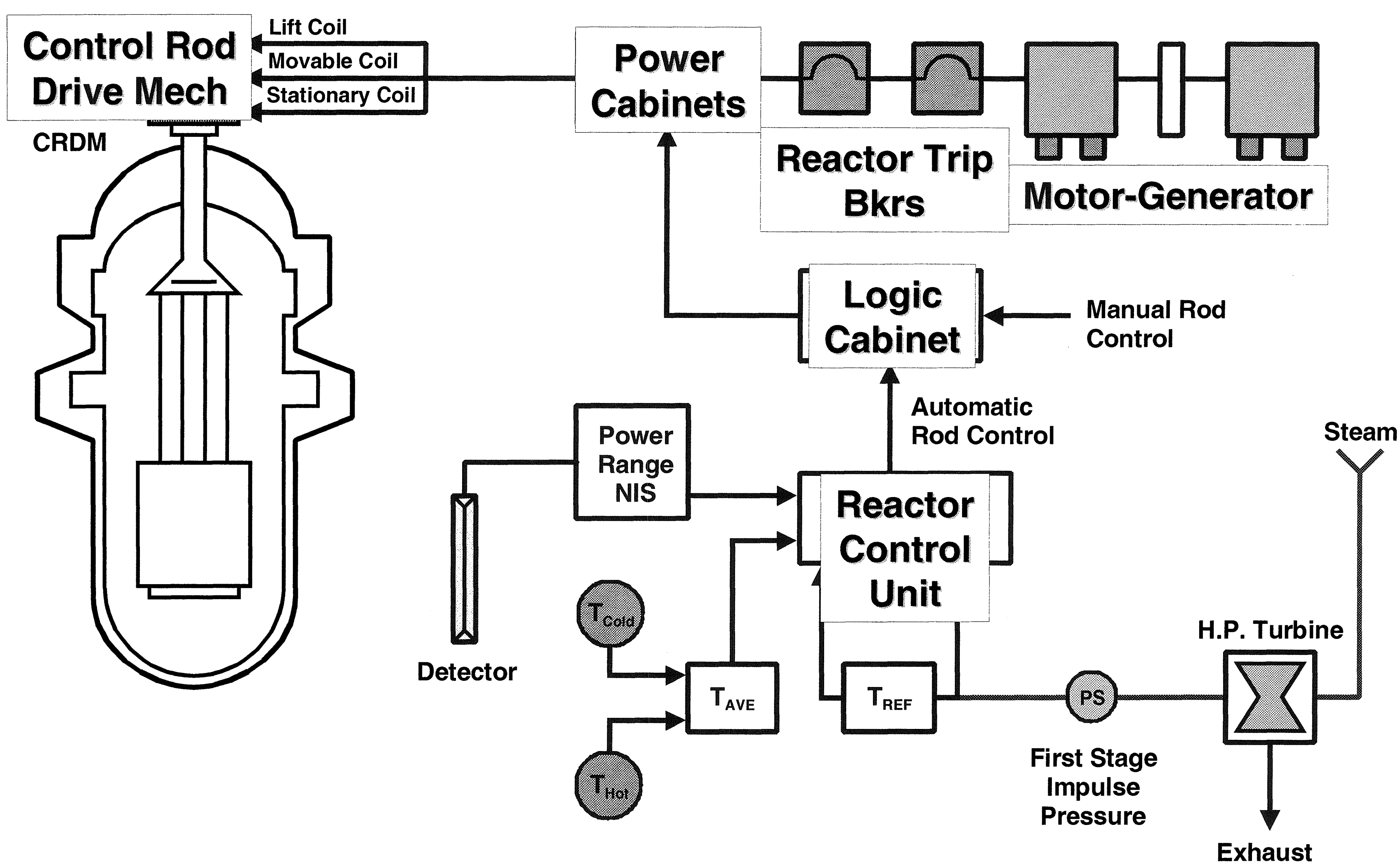
B. Enabling Objectives (Cont'd):

5. Describe the operation of the Rod Control system as it relates to the following:
   a. Precautions and limitations
   b. Major steps performed while placing the Rod Control system in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect Rod Control system operation
   f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the Rod Control system as explained in this lesson:
   a. State Tech Specs/TRM LCOs that govern the Rod Control system
   b. State the $\leq$ 1 hour action limit TS LCOs
   c. Given the conditions/status of the Rod Control system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events:
   a. OE19729; SQN Control Rod Misalignment Coming Out Of Outage
   b. OE19914; WBN Control Rods Fail To Move On Demand
   c. NRC Bltn 96-01, Rods Fail to Fully Insert Following Scrams

VI. **TRAINING AIDS:**

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)

Rod Control Flow Diagram



EO3

Abnormal Operation

- How a instrument failure will affect Rod Control system operation
  - Auctioneered T_{AVG} Signal
  - Turbine Impulse Pressure
  - NIS Failures

EO5

X. LESSON BODY:

H. Abnormal Operation

- Discuss affect on plant conditions for alarms A-7, B-3, B-7, C-7, and D-3 listed on AR-M4-B NIS/Rod Control.

CAUTION: Control Rods should NOT be manually withdrawn during a plant transient.

- Refer to AOP-C.01 "Rod Control System Malfunctions" for abnormal operating criteria:
  - o Continuous rod bank movement
  - o Dropped shutdown/control rod(s)
  - o Misaligned shutdown/control rod(s) or bank - Modes 1 or 2
  - o Misaligned shutdown/control rod(s) or bank - Modes 3, 4 or 5
  - o Failure of control bank to move on demand (AUTO or MANUAL) OR ROD CONTROL SYSTEM URGENT FAILURE alarm LIT. [M-4B window A-6]
  - o Rod Position Indicator (RPI) Malfunction - Modes 1 or 2

20. 005 AA1.01 020
Given the following:

- Following a load reduction to 70% power, Control Bank "D" Rod M-8 was found misaligned from its bank by greater than 12 steps for twenty minutes.
- The crew entered AOP-C.01, "Rod Control System Malfunctions", and is preparing to realign the control rod.
- Reactor Engineering has determined the following:
  - No restrictions apply to realigning the control rod.
  - The misaligned rod is to be moved to the affected bank position.

Which ONE of the following identifies how the Rod Control System will be operated to realign the control rod in accordance with AOP-C.01?

Operators will disconnect the lift coil(s) for ...

A. the misaligned rod and adjust the affected group step counter to match the misaligned rod position.

B. the misaligned rod and adjust the affected bank step counters to match the misaligned rod position.

C. each rod in the affected group (except M-8) and adjust the affected bank step counters to match the misaligned rod position.

D✓ each rod in the affected bank (except M-8) and adjust the affected group step counter to match the misaligned rod position.

<u>*DISTRACTOR ANALYSIS:*</u>

A. Incorrect, All lift coils except M-8 in the bank will be disconnected. Valid because the procedure provides an alternate method of realignment by disconnecting the lift coil for the misaligned rod and moving the other rods to match the misaligned rod. The stem provides information necessary to discriminate between the methods used.

B. Incorrect, All lift coils except M-8 in the bank will be disconnected and the affected group step counters adjusted, not bank counters. Valid because the procedure provides an alternate method of realignment by disconnecting the lift coil for the misaligned rod and moving the other rods to match the misaligned rod. The stem provides information necessary to discriminate between the methods used.

C. Incorrect, All lift coils except M-8 for the bank will be disconnected, not just those in the affected group and the affected group step counter adjusted, not the bank counters.

*D. CORRECT, Lift coils for all the rods in the affected **bank**, EXCEPT the misaligned rod will be disconnected and the affected **group** step counter adjusted to the misaligned rod position.*

Question No. 20

Tier 1 Group 2

K/A 005 AA1.01
Ability to operate and/or monitor the following as they apply to Inoperable/Stuck Control Rod: CRDS

Importance Rating: 3.6 / 3.4

Technical Reference: AOP-C.01, Rev 18

Proposed references to be provided to applicants during examination: None

Learning Objective: OPI271AOP-C.01 B.8.b
Given a set of initial conditions use AOP-C.01 to correctly:
b. Identify required actions

Question Source:
Bank # ____X______
Modified Bank # __________
New _______

Question History: SQN Bank Question AOP-C.01-B.4 003

Question Cognitive Level:
Memory or fundamental knowledge __X____
Comprehension or Analysis _______

10 CFR Part 55 Content: (41.6 / 45.5, 45.6)

10CFR55.43.b (n/a)

Comments: Modified bank question with editorial enhancements only and rearranged order of answer and distractors.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2.3 Misaligned Rod(s) – Modes 1 or 2 (cont'd)

CAUTION: Prior to retrieving misaligned rod at power, SRO and Reactor Engineer will determine length of time the affected rod has been misaligned. Any attempt to realign the rod should be coordinated with Reactor Engineering recommendations to prevent localized power peaking, possible fuel failure, and to minimize xenon oscillations. [C.1] [C.3]

15. **DETERMINE** with Reactor Engineering whether rod alignment should be performed by moving rod bank or by moving affected rod.

16. **CONSULT** Reactor Engineering to determine if rod re-alignment should be done at reduced power:

    a. **IF** power reduction is necessary, **THEN** **PERFORM** the following:

       - **REDUCE** turbine load.
       - **CONTROL** Tavg by boration **USING** 0-SO-62-7.

17. **PLACE** rod control in BANK SELECT for affected bank.

18. **CHECK** whether affected rod bank is to be moved to misaligned rod position.

    RESPONSE NOT OBTAINED: **IF** misaligned rod is to be moved to affected rod bank position, **THEN** **GO TO** Step 22.

2.3 Misaligned Rod(s) – Modes 1 or 2 (cont'd)

22. **RECORD** step counter reading(s) for affected rod bank:

    ___________ Steps
    Group 1 step counter

    ___________ Steps
    Group 2 step counter (if applicable)

NOTE 1: Key #81 is needed to open lift coil disconnect switch panel.

NOTE 2: Toggle switch UP is DISCONNECTED position.

23. **DISCONNECT** all lift coils of rods in affected bank EXCEPT misaligned rod:

CONTROL ROD LOCATION / BANK									
SDA	E-5	E-11	L-11	L-5	B-4	D-14	P-12	M-2	
SDB	G-3	C-9	J-13	N-7	C-7	G-13	N-9	J-3	
SDC	E-3	C-11	L-13	N-5					
SDD	C-5	E-13	N-11	L-3					
CBA	H-6	H-10	F-8	K-8					
CBB	F-2	B-10	K-14	P-6	B-6	F-14	P-10	K-2	
CBC	H-2	B-8	H-14	P-8	F-6	F-10	K-10	K-6	
CBD	D-4	D-12	M-12	M-4	H-4	D-8	H-12	M-8	H-8

24. **ADJUST** affected group step counter to misaligned rod position.

AOP-C.01-B.4 003

Given the following plant conditions:

- Rod M8, in control bank D, has been misaligned for 20 minutes.
- Repairs have been completed.
- The operating crew is ready to realign M8 control rod with it's bank by moving M8 control rod.
- Reactor engineering has determined that there are no restrictions on realignment of the Rod

Which ONE of the following describes the correct actions that must be completed to prepare for realignment of control rod M8?

A.✓ Disconnect the lift coils for each rod in the affected bank (except M8) and adjust the affected group step counters to match the misaligned rod prior to rod movement.

B. Disconnect the lift coils for each rod in the affected group (except M8) and adjust the affected group step counter to match the misaligned rod prior to rod movement.

C. Disconnect the lift coil for the misaligned rod (M8) and adjust the affected bank step counters to match the misaligned rod prior to rod movement.

D. Disconnect the lift coil for the misaligned rod (M8) and adjust the affected group step counter to match the misaligned rod prior to rod movement.

Justification:

A. Correct.

B. All lift coils(except M8) for the bank must be disconnected, vs only disconnecting those in the affected group.

C. This distractor is valid because AOP-C.01 provides an alternate method of realignment by disconnecting the lift coil for the misaligned rod and moving the other rods to match the misaligned rod. The stem gives information to discriminate between which method to use.

D. This distractor is valid because AOP-C.01 provides an alternate method of realignment by disconnecting the lift coil for the misaligned rod and moving the other rods to match the misaligned rod. The stem gives information to discriminate between which method to use.

I. PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: AOP-C.01, ROD CONTROL SYSTEM MALFUNCTIONS

IV. LENGTH OF LESSON/COURSE: 2.0 hour(s)

V. TRAINING OBJECTIVES:

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate *or* explain, using classroom evaluations and/or simulator scenarios, the requirements of AOP-C.01, ROD CONTROL SYSTEM MALFUNCTIONS

B. Enabling Objectives:

	Objectives
0.	Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with Continuous Rod Withdrawal, Dropped Control Rod, and Inoperable/Stuck Control Rod that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate position as identified in Appendix A.
1.	State the purpose/goal of this AOP-C.01.
2.	Describe the AOP-C.01 entry conditions.
	a. Describe the setpoints, interlocks, and automatic actions associated with AOP-C.01 entry conditions.
	b. Describe the ARP requirements associated with AOP-C.01 entry conditions.
	c. Interpret, prioritize, and verify associated alarms are consistent with AOP-C.01 entry conditions.
	d. Describe the plant parameters that may indicate rod control failure.
3.	Describe the initial operator response to stabilize the plant upon entry into AOP-C.01.
4.	Upon entry into AOP-C.01, diagnose the applicable condition and transition to the appropriate procedural section for response.
5.	Summarize the mitigating strategy for the failure that initiated entry into AOP-C.01.
6.	Describe the bases for all limits, notes, cautions, and steps of AOP-C.01.

7.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.
8.	Given a set of initial plant conditions use AOP-C.01 to correctly:
	a. Recognize entry conditions.
	b. Identify required actions.
	c. Respond to Contingencies.
	d. Observe and Interpret Cautions and Notes.
9.	Describe the Tech Spec and TRM actions applicable during the performance of AOP-C.01.
10.	Apply GFE and system response concepts to the abnormal condition – prior to, during and after the abnormal condition.

OBJECTIVES TO BE COVERED IN THESE SEQUOYAH OPERATOR TRAINING PROGRAMS

OBJECTIVE NO.	NONLICENSED OPERATORS	LICENSE TRAINING		
		RO	SRO	REQUAL/SPECIAL
0		X	X	
1.		X	X	
2.		X	X	
3.		X	X	
4.		X	X	
5.		X	X	
6.		X	X	
7.		X	X	
8.		X	X	
9.		X	X	
10.		X	X	

NOTE: The following approval is required for License Requalification and special training only:

Training Program ____

Sequoyah Operator Training Manager __________________________ /________
Date

Sequoyah Operations Manager __________________________ /________
Date

I. **TRAINING AIDS:**

21. 024 AA2.01 021

Given the following:

- A Reactor Trip occurred followed by the crew implementing EA-68-4, Section 4.2, "Emergency Boration from BAT".
- After placing 1-HS-62-138A, Emergency Boration FCV in OPEN, the OATC released the handswitch after observing flow indicated on 1-FI-62-137A, Emerg Boration Flow.
- Two minutes later, the OATC observed both 1-HS-62-138A RED and GREEN lights LIT and flow stable at 50 gpm.

Which ONE of the following identifies the status of FCV-62-138, Emergency Boration FCV and the corresponding emergency boration flow rate?

A. FCV-62-138 stopped opening when the handswitch was released and the flow rate is BELOW the minimum required.

B.✓ FCV-62-138 stopped opening when the handswitch was released and the flow rate is ABOVE the minimum required.

C. FCV-62-138 should be full open but has stopped due to thermal overload and the flow rate is BELOW the minimum required.

D. FCV-62-138 should be full open but has stopped due to thermal overload and the flow rate is ABOVE the minimum required.

<u>*DISTRACTOR ANALYSIS:*</u>

A. Incorrect, the emergency boration valve would stop when the handswitch was released and both the red and green lights would remain lit, however the flow is below the minimum required flow of 35 gpm. Plausible because the MOV does stop when the handswitch is released and flow rate is only slightly higher than the minimum required.

B. CORRECT, the emergency boration valve is a motor operated valve but unlike most MOVs, there is no seal in to cause the valve to run full open after the hand switch is placed to open. Thus the valve would stop when the handswitch was released and the Red and Green indicating lights would both be lit. EA-68-4, Emergency Boration, requires a minimum flow rate of 35 gpm when emergency borating from the BAT.

C. Incorrect, the emergency boration valve should not be full open. Unlike most MOVs it does not have a seal in contact in the control circuit to cause the valve to come full open and the flow rate is not below the required minimum. Plausible because most MOVs do run full open after the handswitch is placed to the open position and released unless the valve travel is stopped due to thermal overload and flow rate is only slightly higher than the minimum required.

D. Incorrect, the emergency boration valve should not be full open. Unlike most MOVs it does not have a seal in contact in the control circuit to cause the valve to come full open but the flow rate is above the required minimum. Plausible because most MOVs do run full open after the handswitch is placed to the open position and released unless the valve travel is stopped due to thermal overload and flow rate is above the the minimum required.

Question No. 21

Tier 1 Group 1

K/A 024 AA2.01
Ability to determine and interpret the following as they apply to the Emergency Boration: Whether boron flow and/or MOVs are malfunctioning, from plant conditions

Importance Rating: 3.8* / 4.1

Technical Reference: EA-68-4, Emergency Boration, Rev 10
1-47W611-62-2 R5
1,2-45N779-24 R23

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.CVCS B.4.d & f
Describe the following characteristics of each major component in the CVCS system:
d. Normal operating parameters
f. Controls

Question Source:
Bank # __________
Modified Bank # __________
New _X_____

Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge _______
Comprehension or Analysis _X_____

10 CFR Part 55 Content: (43.5 / 45.13)

10CFR55.43.b (n/a)

Comments: New question for SQN 1/2009 exam

4.2 Emergency Boration from BAT

1. **PLACE** boric acid transfer pumps in fast speed. ☐

2. **ADJUST** emergency borate valve **[FCV-62-138]** to obtain boric acid flow between 35 gpm and 150 gpm on **[FI-62-137A]**. ☐

3. **MONITOR** emergency boration flow:

   a. **CHECK** emergency boration flow established on **[FI-62-137A]**. ☐

   b. **IF** boric acid flow less than 35 gpm,
      THEN
      CLOSE recirculation valve for the BAT aligned to the blender: ☐

      - 1-FCV-62-237 for BAT A.
      - 0-FCV-62-241 for BAT C.
      - 2-FCV-62-237 for BAT B.

4. **IF** emergency boration flow NOT established,
   THEN
   ALIGN normal boration path:

   a. **VERIFY** VCT outlet valves LCV-62-132 and LCV-62-133 OPEN. ☐

   b. **ALIGN** normal boration to VCT outlet:

      - **OPEN** FCV-62-140. ☐
      - **OPEN** FCV-62-144. ☐

   c. **CHECK** boration flow greater than 35 gpm on FI-62-139. ☐

4.2 Emergency Boration from BAT (Continued)

5. **IF** boration flow greater than 35 gpm is NOT established,
   THEN
   PERFORM one of the following:

   - **GO TO** Section 4.3 to emergency borate from RWST. ☐

     OR

   - **ALIGN** alternate emergency boration:

     1) **ENSURE** FCV-62-140 OPEN. ☐

     2) **LOCALLY OPEN** boric acid to CCP valve VLV-62-929.
        [Aux Bldg, elev 690, boric acid blender] ☐

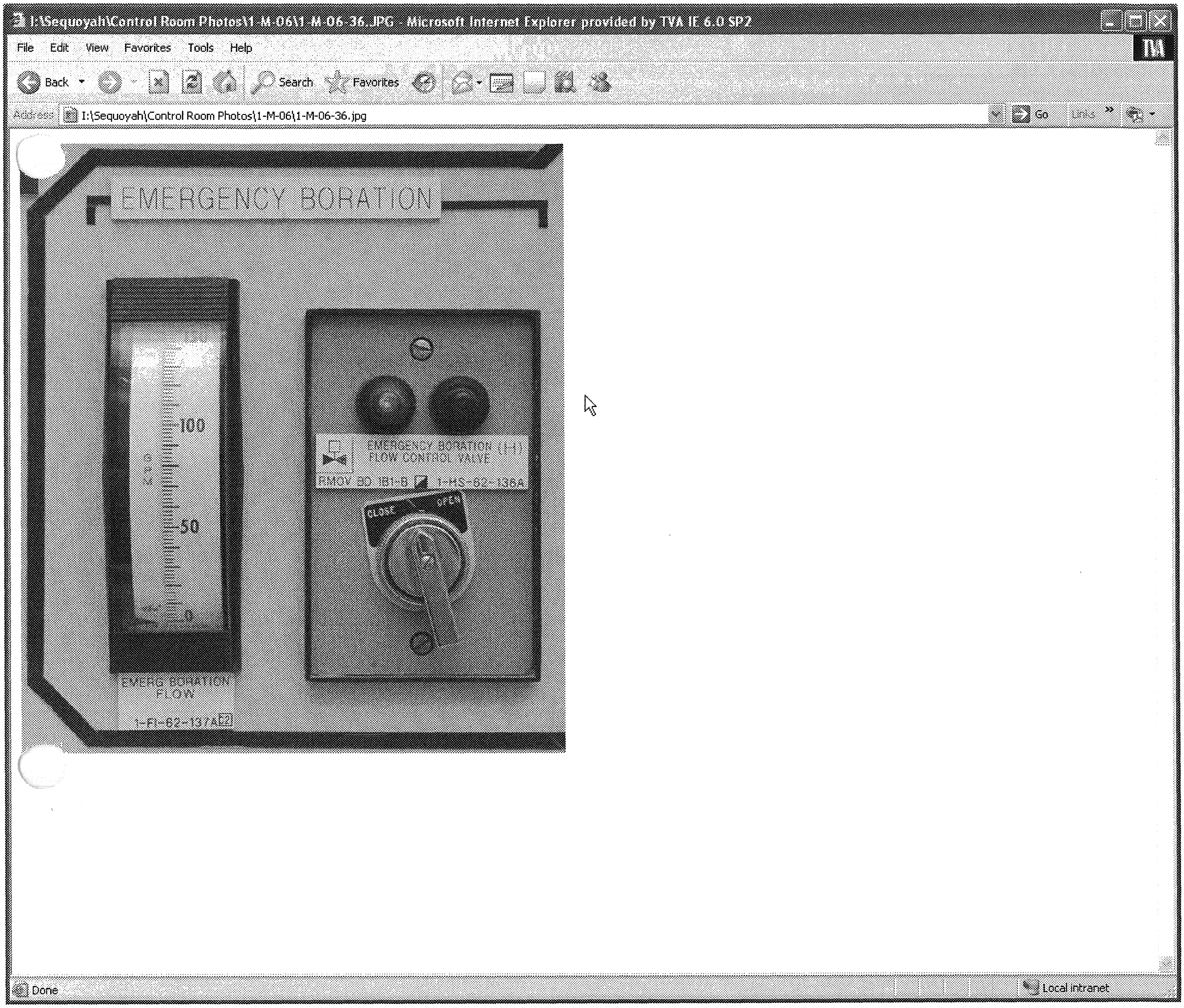
     3) **CHECK** boration flow greater than 35 gpm on FI-62-139. ☐

6. **VERIFY** charging flow established. ☐

CAUTION **Boration flowrate greater than charging flow (minus seal return flow) will result in overfilling VCT.**

7. **MAINTAIN** boric acid flow between 35 gpm and 150 gpm. ☐

8. **MONITOR** BAT level. ☐



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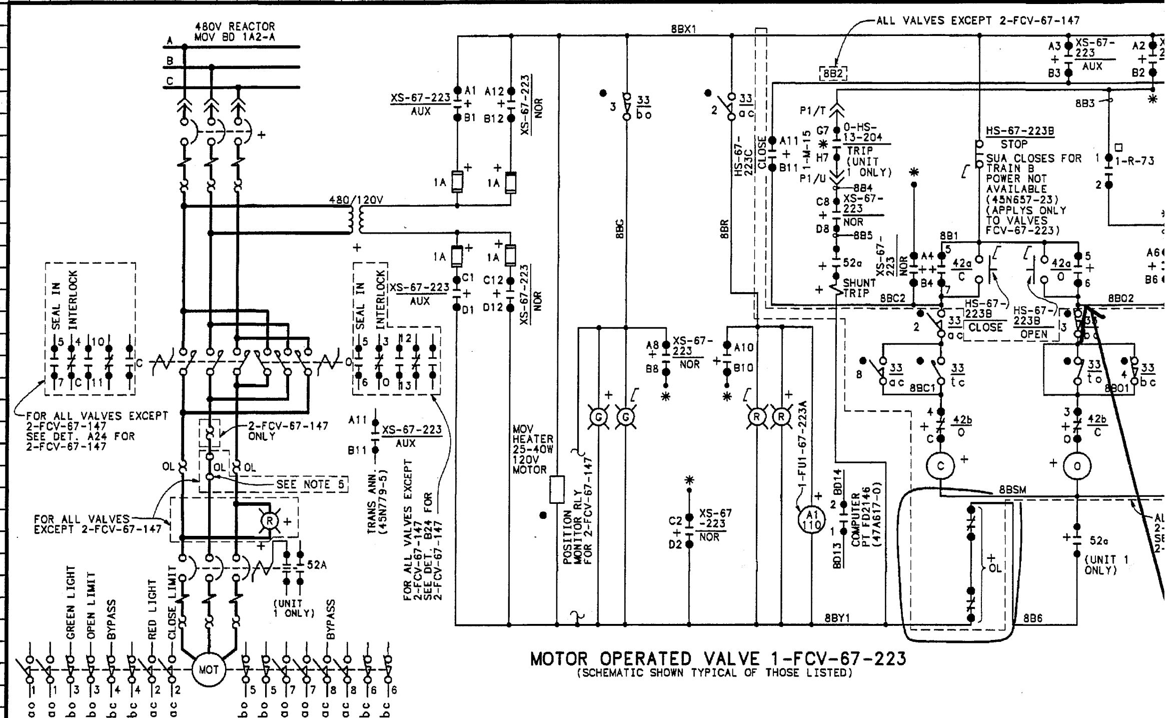
Go
Links
EMERGENCY BORATION
100
GPM
50
0
EMERG BORATION
FLOW
1-FI-62-137A
EMERGENCY BORATION
FLOW CONTROL VALVE
RMOV BD 1B1-B
1-HS-62-138A
CLOSE
OPEN
Done
Local intranet

1,2-45N779-24 | E | 45

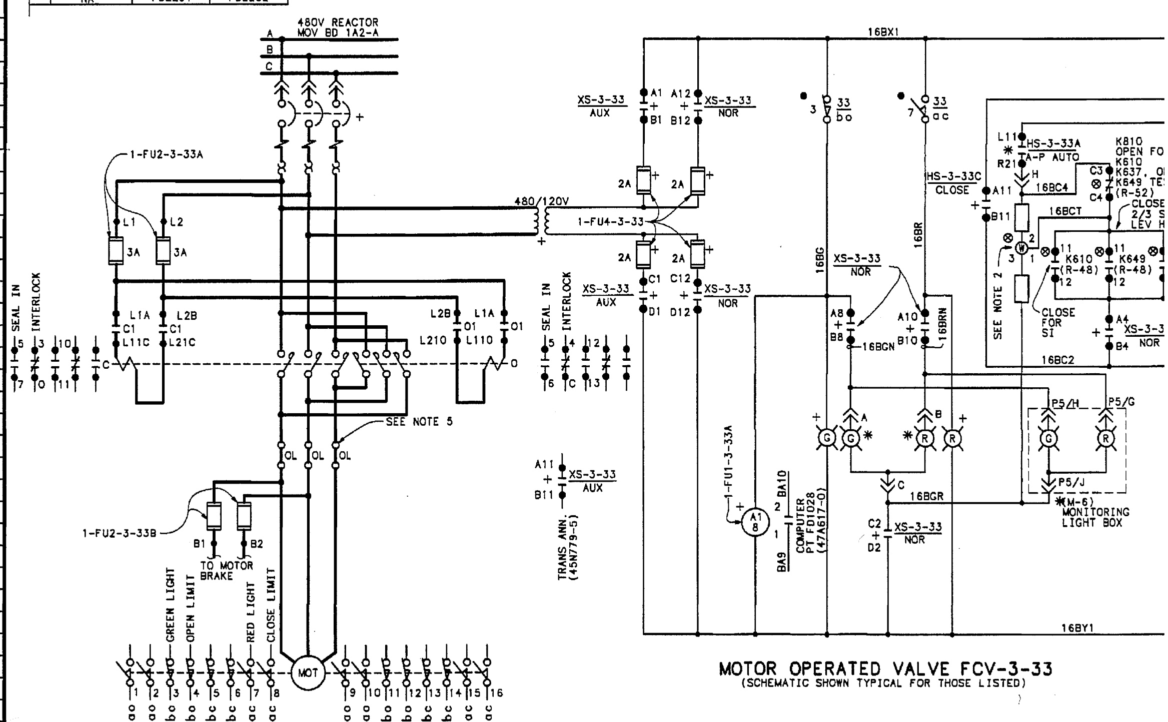


MOTOR OPERATED VALVE 1-FCV-67-223
(SCHEMATIC SHOWN TYPICAL OF THOSE LISTED)

TVA VALVE NO.	VALVE NOMENCLATURE	TRAIN	SUPPLY UNIT 1	SUPPLY UNIT 2	WIRE PREFIX UNIT 1	WIRE PREFIX UNIT 2	CONTROL SW	RELAY LOC (CONT)	STATUS MONITOR SYSTEM	FUSE UNID'S NOR & AUX CONT	FILTER FUSE UN
1-FCV-67-223	SUPPLY HDR 1B TO HDR 2A ISLN VLV	A	1A2-A		8B		HS-67-223 B,C; XS-67-223	1-R-73 (1 & 2)	1A1-109, 1A1-110	1-FU4-67-223	1-FU1-6
2-FCV-67-223	SUPPLY HDR 2A TO HDR 1B ISLN VLV	A		2A2-A		8B	HS-67-223 B,C; XS-67-223	1-R-73 (3 & 4)	2A1-109, 2A1-110	2-FU4-67-223	2-FU1-6
1-FCV-67-147	SUPPLY HDR 1A TO HDR 2B ISLN VLV	A	1A2-A		9A		HS-67-147 B,C; XS-67-147	NA	A1-111, A1-112 (OPEN)	1-FU4-67-147	1-FU1-6
2-FCV-67-147	SUPPLY HDR 2B TO HDR 1A ISLN VLV	B		2B2-B		3B	HS-67-147 B,C; XS-67-147	NA	B1-107, B1-108 (CLOSED)	2-FU4-67-147	2-FU1-6

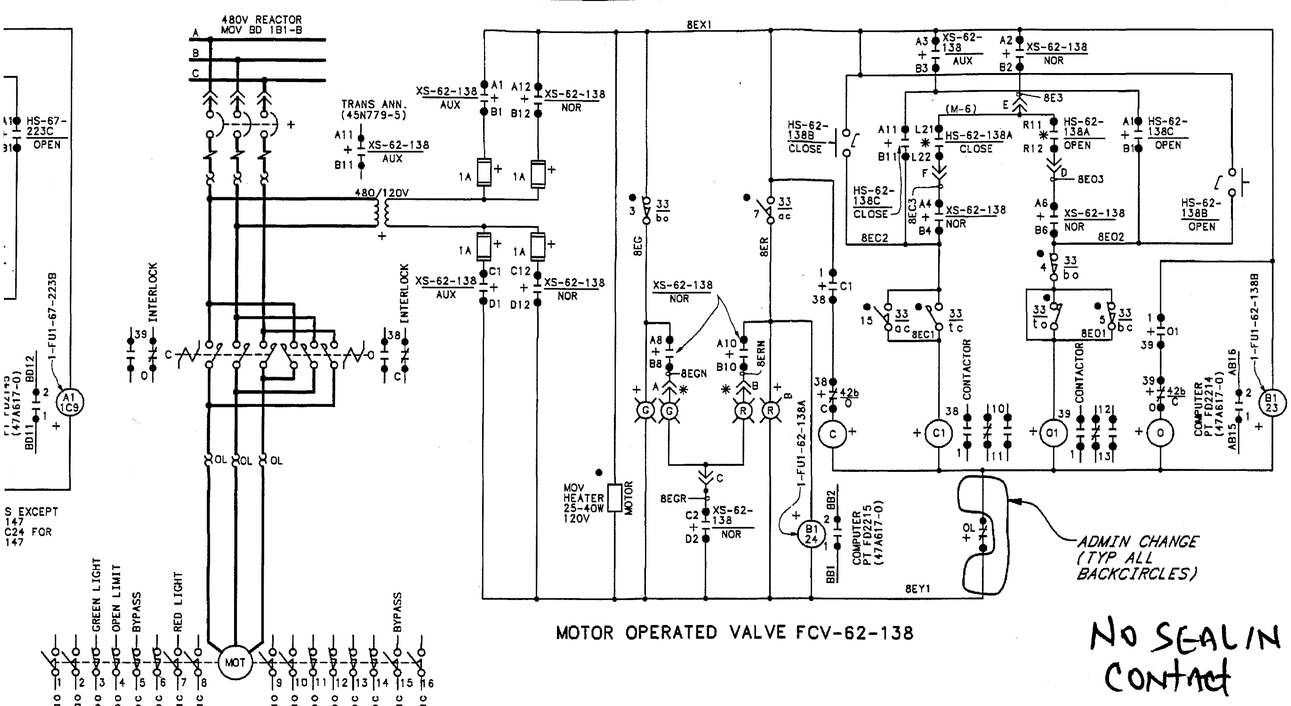
SHUNT TRIP BKR LOC	COMPUTER POINT CONTROL PWR	COMPUTER POINT POSITION
9E2	FD2145	FD2146
NA	FD2145	FD2146
9E1	FD2291	FD2292
NA	FD2291	FD2292

SEAL
foun



MOTOR OPERATED VALVE FCV-3-33
(SCHEMATIC SHOWN TYPICAL FOR THOSE LISTED)

TVA VALVE NO.	VALVE NOMENCLATURE	TRAIN	SUPPLY UNIT 1	SUPPLY UNIT 2	WIRE PREFIX UNIT 1	WIRE PREFIX UNIT 2	CONTROL SW	SSPS LOC	CONTACT NO'S K610	CONTACT NO'S K649	CONTACT NO'S K637	SSPS TEST CIRCUITRY LOCATION	SSPS TEST CIRCUITRY CONTACT NOS.	STATUS MONITOR SYSTEM	NOR & AUX CONT	UNI
FCV-3-33	STEAM GEN FW ISLN VALVE	A	1A2-A	2A2-A	16B	16B	HS-3-33A; C;XS-3-33	R-48	11,12	11,12	7,8	R-52	C3, C4	A1-7, A1-8	1-FU4-3-33	1-F
FCV-3-87	STEAM GEN FW ISLN VALVE	A	1A2-A	2A2-A	17C	17C	HS-3-87A; C;XS-3-87	R-48	13,14	13,14	9,10	R-52	J3, J4	A1-9, A1-10	1-FU4-3-87	1-F
FCV-3-47	STEAM GEN FW ISLN VALVE	B	1B2-B	2B2-B	16C	16C	HS-3-47A; C;XS-3-47	R-51	11,12	11,12	7,8	R-53	C3, C4	B1-3, B1-4	1-FU4-3-47	1-F
FCV-3-100	STEAM GEN FW ISLN VALVE	B	1B2-B	2B2-B	17A	17A	HS-3-100A; C;XS-3-100	R-51	13,14	13,14	9,10	R-53	J3, J4	B1-5, B1-6	1-FU4-3-100	1-F

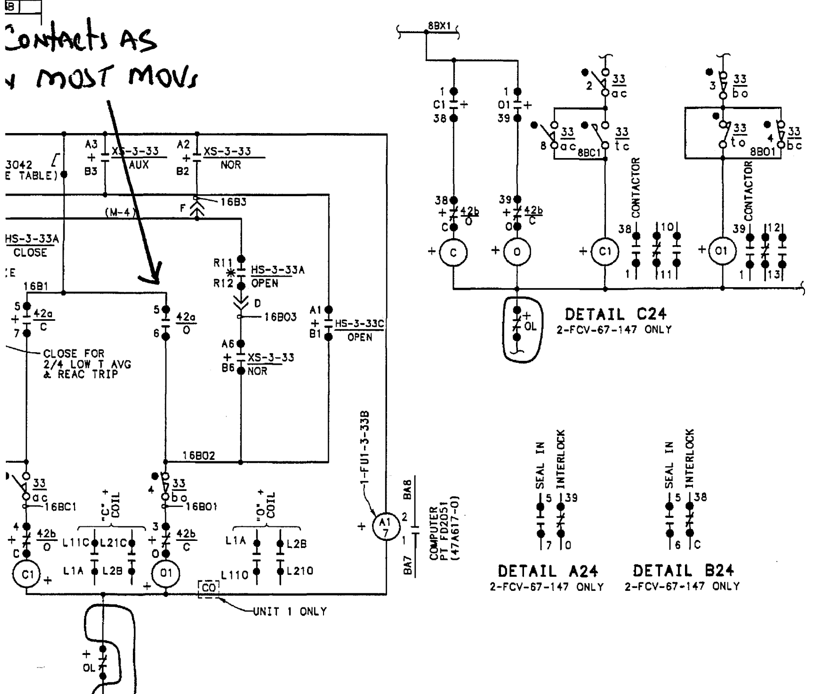


MOTOR OPERATED VALVE FCV-62-138

No SEAL IN Contact

TVA VALVE NO.	Ⓦ VALVE NO.	VALVE NOMENCLATURE	SUPPLY UNIT 1	SUPPLY UNIT 2	WIRE PREFIX UNIT 1	WIRE PREFIX UNIT 2	CONTROL SW	TRAIN	STATUS MONITOR SYSTEM	FUSE UNIDS (SEE NOTE 3) NOR & AUX CONT	FILTER NET FUSE UNID
FCV-62-138	8104	EMERG BORATION FLOW CONT VALVE	1B1-B	2B1-B	8E	8E	HS-62-138A,B,C; XS-62-138	B	B1-23, B1-24	1-FU4-62-138	1-FU1-62-138A/B

Contacts AS
MOST MOVs



NOTES:
1. FOR GENERAL NOTES, SEE 45N779-1.
2. ILLUMINATED PUSHBUTTON SWITCH WITH 28V LAMP NO. 327
3. FUSE NUMBERS SHOWN IN TABLES ARE SIMILAR TO UNIT 2. EXAMPLE: 1-FU1-62-138A-A OR B TRAIN DES TO COMPLETE FUSE UNID — THIS NUMBER WILL CHANGE TO 2 FOR UNIT 2 BDS.
4. POWER HAS BEEN REMOVED FROM 1 & 2-FCV-67-147, -223 BY OPENING THEIR RESPECTIVE ACB'S.
5. OVERLOAD HEATER ELEMENTS REMOVED AND JUMPER INSTALLED AS NOTED BY

LOCATION SYMBOLS:
- † - EQUIPTMENT LOCATED ON 6900V SWGR
- △ - EQUIPTMENT LOCATED IN AUX CONTROL RM
- □ - TVA BOP RACKS IN AUX INSTR RM
- ⊗ - AUX INST ROOM (NSSS RACKS)
- ✱ - EQUIPTMENT LOCATED ON UNIT CONT BD
- [- EQUIPTMENT LOCATED ON LOCAL CONT STATION
- + - EQUIPTMENT LOCATED ON MOTOR CONT CENTER
- ● - LOCATED ON ASSOCIATED EQUIPMENT

MONITORING LIGHT BOX BOX IDENTIFICATION	WINDOW NO.	SCHEMATIC UNIT 1	SCHEMATIC UNIT 2	COMPUTER POINT CONTROL PWR	COMPUTER POINT POSITION
XX-55-6K	29	45W655-48	45W655-52	FD2051	FD1028
XX-55-6K	42	45W655-48	45W655-52	FD2056	FD1030
XX-55-6L	29	45W655-49	45W655-53	FD2199	FD1029
XX-55-6L	42	45W655-49	45W655-53	FD2200	FD1031

FUSE UNIDS (SEE NOTE 3) POWER UNIT 2 ONLY	BRAKE UNIT 1 ONLY	BRAKE UNIT 2 ONLY	FILTER NET FUSE UNID	JB SPLICE UNIT 1	JB SPLICE UNIT 2	PLUG NO.	PIN IDENTIFICATION 16BGOU	16BGN	16BRN
2-FU2-3-33A	1-FU2-3-33B	2-FU2-3-33B	1-FU1-3-33A/B	3042	3062	P5	J	H	G
2-FU2-3-87A	1-FU2-3-87B	2-FU2-3-87B	1-FU1-3-87A/B	2858	2891	P7	J	H	G
2-FU2-3-47A	1-FU2-3-47B	2-FU2-3-47B	1-FU1-3-47A/B	2857	2890	P5	J	H	G
2-FU2-3-100A	1-FU2-3-100B	2-FU2-3-100B	1-FU1-3-100A/B	3066	3060	P7	M	L	K

CONTINUED ABOVE

REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
23	ADMIN CHANGE	DGR	DMW	RW	7-25-05

INC: ADMIN CHANGE PER RIMS: B85 050722 001
THIS RESOLVES PER 82247

SCALE: NONE EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2
CATEGORY 1

WIRING DIAGRAM
480V SHUTDOWN AUX POWER
SCHEMATIC DIAGRAM SH 24

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: M.J.BERKLEY	CHECKER: R.W.LOWERY	R0 ISSUE PER: CCD RECONCILIATION SHEET NO.CCD-8128. DRAWING MADE A CCD FROM AC-EE & AD-R25. INC WP 1516-01 PER DCN M01516A & DCA M01516-1386 R0.	1 R.W.LOWERY
DESIGNER: N/A	REVIEWER: K.R.SPINO		2 N.S.SHAH
			3 M.R.SEDLACIK

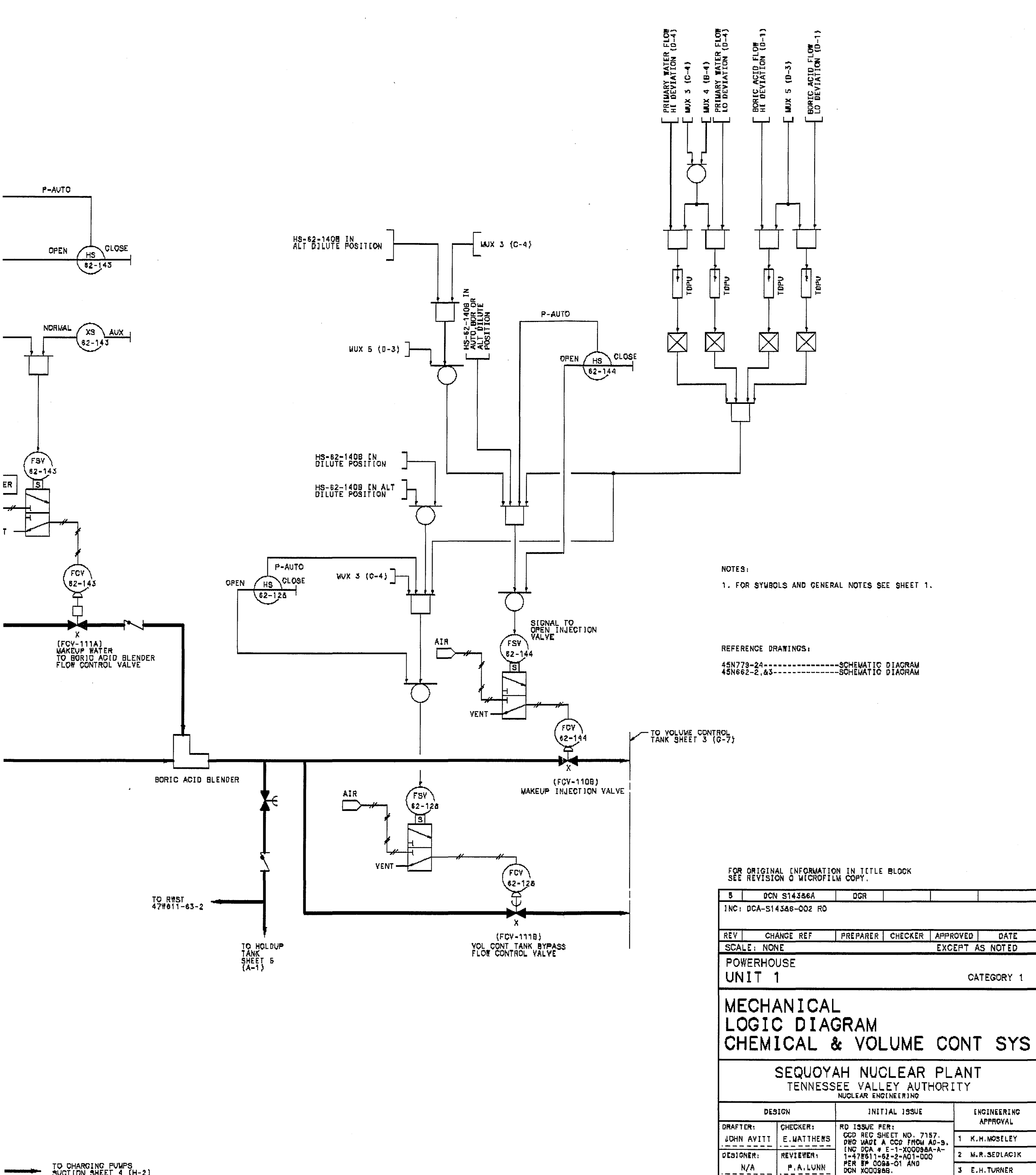
DATE 5-20-90 | 45 | E | CCD NO: 1,2-45N779-24 R23

ISSUED BY: P.G. TRUDEL

CAD MAINTAINED DRAWING

CONTROL ROOM DWG

pull



NOTES:

1. FOR SYMBOLS AND GENERAL NOTES SEE SHEET 1.

REFERENCE DRAWINGS:

45N779-24----------------SCHEMATIC DIAGRAM
45N662-2,&3--------------SCHEMATIC DIAGRAM

FOR ORIGINAL INFORMATION IN TITLE BLOCK SEE REVISION 0 MICROFILM COPY.

REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
5	DCN S14386A	DGR			
INC: DCA-S14386-002 R0					

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE
UNIT 1 CATEGORY 1

MECHANICAL
LOGIC DIAGRAM
CHEMICAL & VOLUME CONT SYS

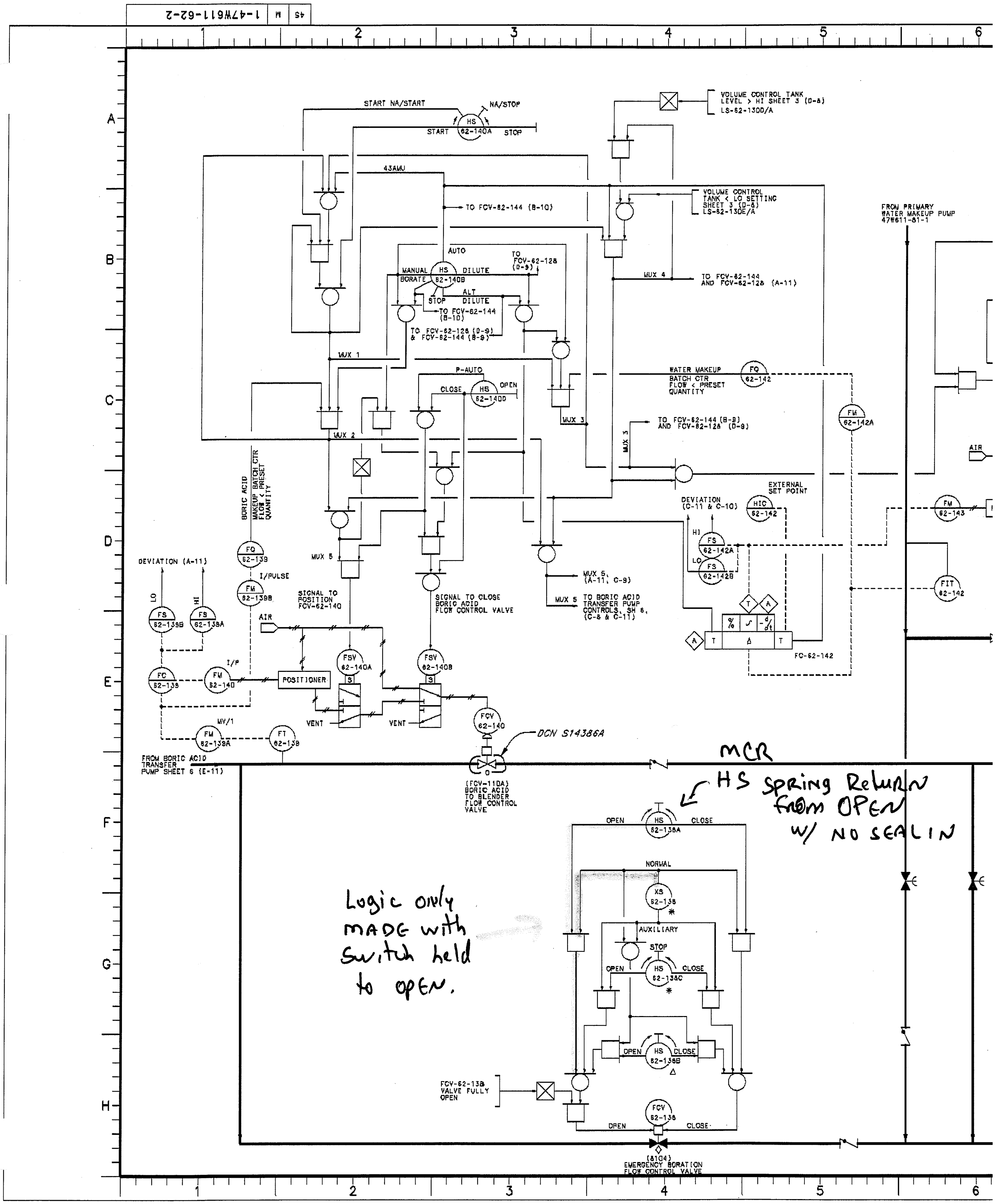
SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
NUCLEAR ENGINEERING

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: JOHN AVITT	CHECKER: E.MATTHEWS	R0 ISSUE PER: CCD REC SHEET NO. 7157. DWG MADE A CCD FROM AD-9. INC DCA # E-1-X00098A-A-1-47W611-62-2-A01-000 PER EP 0098-01 AND DCN X00098B.	1 K.H.MOSELEY
DESIGNER: N/A	REVIEWER: P.A.LUNN		2 M.R.SEDLACIK
			3 E.H.TURNER
DATE 1-31-89	45 M	CCD NO: 1-47W611-62-2	R5

ISSUED BY: P.G.TRUDEL

DRAWING SERVICES UNIT
PROCAD MAINTAINED DRAWING
THIS CONFIGURATION CONTROL DRAWING IS MAINTAINED BY THE SQN CAD UNIT AND IS NOT PART OF THE TVA PROCADAM DATABASE.
COMPUTER GRAPHICS

CONTROL ROOM DWG


1-47W611-62-2 M 45
START NA/START
NA/STOP
HS 62-140A
START STOP
43AWU
TO FCV-62-144 (B-10)
VOLUME CONTROL TANK LEVEL > HI SHEET 3 (D-8) LS-62-130D/A
VOLUME CONTROL TANK < LO SETTING SHEET 3 (D-8) LS-62-130E/A
FROM PRIMARY WATER MAKEUP PUMP 47W611-81-1
AUTO
MANUAL BORATE
HS 62-140B
DILUTE
TO FCV-62-128 (D-9)
STOP
ALT DILUTE
TO FCV-62-144 (B-10)
TO FCV-62-128 (D-9) & FCV-62-144 (B-9)
MUX 4
TO FCV-62-144 AND FCV-62-128 (A-11)
MUX 1
P-AUTO
CLOSE
HS 62-140D
OPEN
WATER MAKEUP BATCH CTR FLOW < PRESET QUANTITY
FQ 62-142
FM 62-142A
MUX 2
MUX 3
TO FCV-62-144 (B-9) AND FCV-62-128 (D-9)
AIR
BORIC ACID MAKEUP BATCH CTR FLOW < PRESET QUANTITY
EXTERNAL SET POINT
DEVIATION (C-11 & C-10)
HIC 62-142
FM 62-143
HI
FS 62-142A
LO
FS 62-142B
DEVIATION (A-11)
FQ 62-139
MUX 5
MUX 5, (A-11, C-9)
MUX 5 TO BORIC ACID TRANSFER PUMP CONTROLS, SH 6, (C-8 & C-11)
FIT 62-142
I/PULSE
LO
HI
FM 62-139B
FS 62-139B
FS 62-139A
SIGNAL TO POSITION FCV-62-140
SIGNAL TO CLOSE BORIC ACID FLOW CONTROL VALVE
AIR
FC-62-142
FSV 62-140A
FSV 62-140B
I/P
FC 62-139
FM 62-140
POSITIONER
VENT
VENT
FCV 62-140
MV/I
FM 62-139A
FT 62-139
DCN S14386A
FROM BORIC ACID TRANSFER PUMP SHEET 6 (E-11)
(FCV-11DA) BORIC ACID TO BLENDER FLOW CONTROL VALVE
MCR
HS Spring Return from OPEN w/ NO SEALIN
OPEN
HS 62-138A
CLOSE
NORMAL
XS 62-138
Logic only made with switch held to open.
AUXILIARY
STOP
OPEN
HS 62-138C
CLOSE
OPEN
HS 62-138B
CLOSE
FCV-62-138 VALVE FULLY OPEN
FCV 62-138
OPEN
CLOSE
(8104) EMERGENCY BORATION FLOW CONTROL VALVE

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** CHEMICAL AND VOLUME CONTROL

IV. **LENGTH OF LESSON:** 4 hour lecture; 1 hour simulator demonstration; 1 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Chemical and Volume Control (CVCS) system in the plant and on the simulator.

B. Learning Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge and abilities associated with the CVCS system that are rated $\geq$ 2.5 during Initial License Training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the CVCS system as described in the FSAR.
2. State the design basis of the CVCS system in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the CVCS system as illustrated on a simplified system drawing.
4. Describe the following characteristics of each major component in the CVCS system:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the CVCS system components are designed
   m. Location of controls and indications associated with the CVCS system in the control room and auxiliary control room

V. TRAINING OBJECTIVES (Cont'd):

B. Learning Objectives (Cont'd):

5. Describe the operation of the CVCS system:
   a. Precautions and limitations
   b. Major steps performed while placing the CVCS system in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect CVCS system operation
   f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the CVCS system:
   a. State Tech Specs/TRM LCOs that govern the CVCS
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the CVCS system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events

VI. TRAINING AIDS:

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)

22. 036 AK3.01 022
Given the following:

- Unit 1 in Mode 6 with core reload in progress.
- Annunicator "Source Range High Flux Level At Shutdown" alarms unexpectedly.
- Source Range instruments indicate counts are rising.

Which ONE of the following correct relative to the alarm setpoint and actions required if the alarm is valid?

The alarm setpoint is automatically set at _(1)__ times the lowest background count rate while the count rate is decreasing and if the alarm is valid, then, ___(2)___.

	(1) Setpoint	(2) Required Actions
A.	1.5;	Announce over the PA system to evacuate containment and notify the Refueling SRO to immediately suspend core alterations.
B.	1.5;	Notify the Refueling SRO to immediately suspend core alterations but containment evacuation is NOT required.
C.✓	3.0;	Announce over the PA system to evacuate containment and notify the Refueling SRO to immediately suspend core alterations.
D.	3.0;	Notify the Refueling SRO to immediately suspend core alterations but an announcement to evacuate containment is NOT required.

DISTRACTOR ANALYSIS:

A. *Incorrect, The ARI identifies the alarm setpoint is automatically set at 3.0 times (not 1.5 times) the lowest background count rate while the count rate is decreasing or at steady-state but if the alarm is valid and unexpected, then evacuating containment is also required. Plausible because the setpoint is set at .5 decades above the lowest background count rate and the PA system announcement to evacuate containment as well as notifying the Fuel Handling Supervisor to immediately suspend core alterations.*

B. *Incorrect, The ARI identifies the alarm setpoint is automatically set at 3.0 times (not 1.5 times) the lowest background count rate while the count rate is decreasing or at steady-state but if the alarm is valid and unexpected, then evacuating containment is also required. Plausible because the setpoint is set at .5 decades above the lowest background count rate and stopping the reloading of the core would stop the change in reactivity from the fuel being loaded.*

C. *CORRECT, The ARI identifies the alarm setpoint is automatically set at 3.0 times the lowest background count rate while the count rate is decreasing or at steady-state and if the alarm is valid and unexpected, the ARI directs the PA system annoucement to evacuate containment. The ARI also directs the use of AOP -C.02, which will direct notification of the Fuel Handling Supervisor to immediately suspend core alterations.*

D. *Incorrect, The ARI identifies the alarm setpoint is automatically set at 3.0 times the lowest background count rate while the count rate is decreasing or at steady-state but if the alarm is valid and unexpected, then evacuating containment is also required. Plausible because the setpoint is correct and stopping the reloading of the core would stop the change in reactivity from the fuel being loaded.*

Question No. 22

Tier 1 Group 2

K/A 036 AK3.01
Knowledge of the reasons for the following responses as they apply to the Fuel Handling Incidents: Different inputs that will cause a reactor building evacuation

Importance Rating: 3.1 / 3.7

Technical Reference: AOP-M.02, Uncontrolled RCS Boron Concentration Changes, Rev 6
1-AR-M4-B, NIS/Rod Control, Rev 27

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271.FH B.5.c
Describe the operation of the Fuel Handling system as it relates to the following:
c. Alarms and alarm response

Question Source:
Bank # __________
Modified Bank # ___X______
New _______

Question History: SQN Exam 1/2009,
modified Sequoyah question AOP-C.02-B.2 003

Question Cognitive Level:
Memory or fundamental knowledge ___X____
Comprehension or Analysis _______

10 CFR Part 55 Content: (41.5, 41.10 / 45.6)

10CFR55.43.b (n/a)

Comments: Sequoyah question AOP-C.02-B.2 003 modified

SOURCE RANGE HIGH FLUX LEVEL AT SHUTDOWN

Source	Setpoint
SER 308 Shutdown monitor on M-13	Alarm setpoint is automatically set at 3.0 times the lowest background count rate while countrate is decreasing or at steady-state. The alarm setpoint will not change if the countrate increases.

Probable Causes

1. Positive reactivity addition:
   a. RCS dilution (deliberate or inadvertent).
   b. Rod withdrawal.
   c. Xenon decay.
   d. Reactor cooldown.
2. Welding near SRM instrumentation and transmission cable.
3. Relocation of neutron source assembly during refueling.

NOTE

This alarm initiates containment high flux at shutdown evacuation alarm inside containment. The alarm must be manually reset at the shutdown monitors on M-13 prior to the alarm on M-4 panel clearing when count rate drops below alarm setpoint.

Corrective Actions

[1] **IF** shutdown banks are being withdrawn or reactivity change is deliberate and alarm is valid, **THEN**
PERFORM the following:

[a] **OBTAIN** SRO approval.

[b] **RESET** shutdown monitors on 1-M-13:
1-XIS-92-5001 Alarm Setpoint Reset Switch
1-XIS-92-5002 Alarm Setpoint Reset Switch

[2] **IF** alarm is valid and unexpected, **THEN**
PERFORM the following:

[a] **ANNOUNCE** over PA system to evacuate containment.

[b] **GO TO** AOP-C.02, *Uncontrolled RCS Boron Concentration* Changes.

[3] **IF** alarm is not valid, **THEN**
ANNOUNCE over PA system the containment evacuation alarm was false.

[4] **IF** alarm is the result of SRM failure, **THEN**
GO TO AOP-I.01, *Nuclear Instrument Malfunction.*

References

45B655-04B-0, 45N657-13

2.3 Uncontrolled Dilution in Mode 3, 4, 5, or 6

1. **IF** affected unit is in Mode 6,
   THEN
   NOTIFY Fuel Handling Supervisor to immediately suspend core alterations.

CAUTION **If RCS boron concentration is below the minimum required for shutdown margin in Modes 3-5 (LCO 3.1.1.1 or 3.1.1.2) or below the minimum required for Mode 6 (LCO 3.9.1), then Tech Specs require immediately initiating boration until RCS boron is restored to above the minimum. Required boration flow rate is at least 35 gpm from BAT or at least 90 gpm from RWST.**

2. **RESTORE** Boron Concentration as necessary **USING**

   - Appendix B, Emergency Boration

     OR

   - 0-SO-62-7, Boron Concentration Control

3. **STOP** primary water flow to blender:

   - **ENSURE** FCV-62-143, Primary Water Supply to Blender, CLOSED.

QUESTIONS REPORT
for BANK SQN Questions

AOP-C.02-B.2 003

Given the following:

- Unit 1 is in Mode 6.
- Fuel movement in progress.
- Audible count rate begins to increase.
- High flux at shutdown alarms.
- Source range counts increasing.

Which ONE (1) of the following actions should be taken?

A. Initiate normal boration.

B.✓ Suspend core alterations and emergency borate.

C. Place the high flux at shutdown switch for each SRM to block.

D. Suspend core alterations and open the primary water supply to the blender.

Justification:

A. Incorrect. AOP requires immediate suspension of core alterations and emergency boration.

B. Correct. AOP requires as first 2 steps.

C. Incorrect. These actions for an invalid alarm. SRM counts increasing make this alarm valid.

D. Incorrect. AOP requires closing PMW supply to blender to eliminate this as a cause for the dilution.

V. **TRAINING OBJECTIVES (Cont'd):**

B. Learning Objectives (Cont'd):

5. Describe the operation of the Fuel Handling system as it relates to the following:
   a. Precautions and limitations
   b. Major steps performed while refueling.
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect Fuel Handling system operation
6. Describe the administrative controls and limits for the Fuel Handling system as explained in this lesson:
   a. State Tech Specs/TRM LCOs that govern the Fuel Handling Systems.
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the Fuel Handling system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events:
   a. SQN LER93016 Tilted Fuel Assembly
   b. SQN-LER 2-93-3 Equipment Hatch not closed during Fuel Movement
   c. SQN-NOV 94-11 Non-conservative Fuel Handling Practices
   d. SOER 85-01 Reactor Cavity Seal Failure, Connecticut Yankee
   e. OE8112 Movement of irradiated fuel with Ventilation system inop, Dresden 2
   f. SOER 94-2 Boron dilution Events in PWRs

VI. **TRAINING AIDS:**

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector

23. 059 AK1.02 023

Given the following:

- An accidental spill of the Monitor Tank occurred in the Auxiliary Building.
- After isolating the spill, Radcon reported the following conditions:
  - General area radiation levels of 125 mR/hr at 30 cm
  - Highest contamination reading of 3.6E3 dpm/100 cm^2

Which ONE of the following describes the combination of postings required for the area and the radiological concern associated with the types of radiation?

	Postings Required	Radiological Concern
A.	Radiation Area; Contamination Area	Radiation is a gamma concern; Contamination is a beta concern.
B.	Radiation Area; High Contamination Area	Radiation is a beta concern; Contamination is a gamma concern.
C.✓	High Radiation Area; Contamination Area	Radiation is a gamma concern; Contamination is a beta concern.
D.	High Radiation Area; High Contamination Area	Radiation is a beta concern; Contamination is a gamma concern.

<u>*DISTRACTOR ANALYSIS:*</u>

A. Incorrect, Radiological concerns are correctly listed, however, the postings do not meet the required combination of High Radiation Area and Contamination Area.

B. Incorrect, Neither the postings nor the radiological concerns satisfy the required combination.

C. CORRECT, Area radiation level meets the criteria for posting as a high radiation area (> 100 mR/hr) and contamination level meets the criteria for posting as a contaminated area (> 1,000 dpm/100 cm^2). Radiation is a gamma concern, while contamination is a beta concern.

D. Incorrect, Neither the postings nor the radiological concerns satisfy the required combination.

Question No. 23

Tier 1 Group 2

K/A 059 AK1.02
Knowledge of the operational implications of the following concepts as they apply to the Accidental Liquid Radwaste Rel.: Biological effects on humans of various types of radiation, exposure levels that are acceptable for nuclear power plant personnel and the units used for radiation-intensity measurements and for radiation exposure levels.

Importance Rating: 2.6 / 3.2

Technical Reference: SPP-5.1, Radiological Controls, Rev 6
RCI-15, Radiological Postings, Rev 15

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271C259 B.1.f & .1
Define and identify the requirements for enterin/working in the following areas
f. High Radiation Area
i. Contamination Area

Question Source:
Bank # __________
Modified Bank # ____X_____
New ________

Question History: ILT 2007 NRC Exam

Question Cognitive Level:
Memory or fundamental knowledge _X______
Comprehension or Analysis _____

10 CFR Part 55 Content: (41.12)

10CFR55.43.b (n/a)

Comments: Modified both the stem conditions and distractors from those used for the ILT 2007 NRC Exam version of the question. Correct answer location moved. Orginal question posting different than this question postings.

6.0 REQUIREMENTS (Continued)

B. Each RCA shall be posted with a conspicuous sign or signs bearing the standard radiation symbol and the words **Caution - Radiologically Controlled Area**. The posting shall also state that an individual monitoring device is required (unless it has been determined that monitoring is not required).

6.7 Radiation Area (10CFR20)

A. A Radiation Area is an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.005 rem (5 mrem) in one hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

B. Each Radiation Area shall be posted with a conspicuous sign or signs bearing the standard radiation symbol and the words **Caution - Radiation Area**

6.8 High Radiation Area (10CFR20)

A. A High Radiation Area is an area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 0.1 rem (100 mrem) in one hour at 30 centimeters from the radiation source or 30 centimeters from any surface that the radiation penetrates.

B. Each High Radiation Area shall be posted with a conspicuous sign or signs bearing the standard radiation symbol and the words **Caution - High Radiation Area** or **Danger - High Radiation Area**.

C. As provided in **10CFR20.1601(c)**, the following controls shall be applied to posted High Radiation Areas in which dose rates do not exceed 1.0 rem/hr at 30 cm from the radiation source or from any surface penetrated by the radiation, in place of the controls required by **10CFR20.1601(a)** and **10CRF20.1601(b)**:

1. Each entryway to such an area shall be barricaded and conspicuously posted as a **High Radiation Area**. Such barricades may be opened as necessary to permit entry or exit of personnel or equipment.

2. Access to, and activities within, each such area shall be controlled by means of a **Radiation Work Permit** (RWP), or equivalent, associated radiation survey, and other appropriate radiation protection equipment and measures.

6.0 REQUIREMENTS (Continued)

D. Positive engineering controls may be necessary to ensure that airborne radioactivity does not spread to other plant areas. Ventilation systems in affected rooms should be operable and maintain a negative pressure differential. Items such as glove bags or containment tents may be utilized to confine the source of airborne radioactivity and portable ventilation systems may be used to control the spread of generated airborne radioactivity. Airborne Radioactivity Areas must be promptly posted and necessary precautions taken to ensure that the airborne radioactivity is confined within the posted area.

6.12 Contamination Area

A. **10CFR20** does not define criteria for establishing or posting of a Contamination Area. The criterion of ≥ 1,000 dpm/100 cm^2 of transferrable contamination is used to define this establishment and posting.

B. A Contamination Area is an area, accessible to individuals, in which transferrable contamination levels are ≥ 1000 dpm/100 cm^2.

C. Each Contamination Area shall be posted with a conspicuous sign or signs bearing the standard radiation symbol and the words **Caution - Contamination Area**.

D. The entrance/exit for a Contamination Area is identified by the use of a step-off-pad (SOP). Directions printed or written on the SOP instruct individuals exiting the area to remove contaminated clothing prior to stepping onto the SOP, to prevent the spread of contamination outside of the posted Contamination Area.

E. It may impractical to post and establish all Contamination Areas as described above. Due to space limitations and physical properties, some areas such as floor drains or sample/instrument panels may be identified with radiation tape and/or radiation caution tags.

6.13 High Contamination Area

A. **10CFR20** does not define criteria for establishing or posting of a High Contamination Area. The criterion of ≥ 50,000 dpm/100 cm^2 of transferrable contamination in the general area is used to define this establishment and posting.

B. A High Contamination Area is an area, accessible to individuals, in which transferrable contamination levels in the general area are ≥ 50,000 dpm/100 cm^2.

059 AK1.02 001

Given the following plant conditions:

- An accidental spill of the Monitor Tank has occurred in the Aux Building.
- Radiation levels in the area of the spill are 40 mr per hour at 30 cm.
- Contamination levels on the floor around the tank are $1.2E^6$ DPM/100 cm^2

Which ONE (1) of the following describes (1) the major radiation concern for the spill, and (2) the postings applied to the area?

A. (1) Area radiation is a gamma concern; Contamination is a gamma concern
(2) Radiation area; Contamination area

B.✓ (1) Area radiation is a gamma concern; Contamination is a beta concern
(2) Radiation area; High Contamination area

C. (1) Area radiation is a beta concern; Contamination is a gamma concern
(2) High Radiation area; Contamination area

D. (1) Area radiation is a beta concern; Contamination is a beta concern
(2) High Radiation area; High Contamination area

A. Incorrect. This area should be posted as a high contamination area
B. Correct. Area radiation is typically gamma, while contamination is beta radiation. Less than 100 mr per hour is a radiation area. Greater than 50,000 DPM/100 cm2 is a contaminated area. Greater than 50,000 dpm/100 cm2 is a high contamination area
C. Incorrect. Concerns for the effects are reversed, and postings are incorrect
D. Incorrect. Concerns for effects of area is incorrect and posting for radiation is incorrect

PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: RADIOLOGICAL POSTINGS AND SIGNS

IV. LENGTH OF LESSON/COURSE: 1-2 hour(s)

V. TRAINING OBJECTIVES:

A. Terminal Objective:

Upon completion of this lesson and others presented, the student shall demonstrate an understanding of Radiological Postings and Signs by successfully completing a written examination as defined by program procedures.

B. Enabling Objectives:

1. Define and identify the requirements for entering/working in the following areas:
   a. Unrestricted Area
   b. Restricted Area
   c. Radiologically Controlled Area
   d. Radioactive Material/Radioactive Material Storage Areas
   e. Radiation Area
   f. High Radiation Area
   g. Locked High Radiation Area
   h. Very High Radiation Area
   i. Contamination Area
   j. High Contamination Area
   k. Airborne Radioactivity Area.

2. Identify the criteria for utilizing Hot Spot Labels/Tags and Radioactive Material Tags.

The following list contains knowledge and ability statements (K/As) from The Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors (PWR) NUREG-1122, Revision 2 that are applicable to the Initial Licensed Candidate training program. As such, questioning in these areas will be included on any testing in preparation of, or included in obtaining either RO or SRO NRC license.

K/A #	K/A Statement	10CFR55 Sect. Link(s)	IMPORTANCE RO/SRO
G 2.3.1	Knowledge of 10CFR20 and related facility radiation control requirements.	41.12 / 43.4. 45.9 / 45.10	2.6/3.0
G 2.3.2	Knowledge of facility ALARA program.	41.12 / 43.4 / 45.9 / 45.10	2.5/2.9
G 2.3.4	Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized.	43.4 / 45.10	2.5/3.1
G 2.3.5	Knowledge of use and function of personnel monitoring equipment.	41.11 / 45.9	2.3/2.5
G 2.3.7	Knowledge of the process for preparing a radiation work permit.	41.10 / 45.12	2.0/3.3
G 2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.	43.4 / 45.10	2.9/3.3

24. 067 AG2.1.31 024

Given the following:

- A fire is reported on MFPT Oil Tank 1A.
- The HPFP System is actuated from the Control Room using control switch 1-HS-26-75A, MFPT OIL TANK 1A FOG CONTROL.

Which ONE of the following combinations shows the expected status of the indicating lights on 1-HS-26-75A after actuating the HPFP System?

	AMBER	**WHITE**	**RED**
A.	OFF	LIT	LIT
B.	LIT	OFF	LIT
C.	LIT	LIT	OFF
D.✓	LIT	LIT	LIT

DISTRACTOR ANALYSIS:

A. *Incorrect, the Amber light would NOT be off. Plausible because the candidate may recall the amber light normally is lit and relate this circuit to other circuits where the light will be turned off when the circuit is actuated (i.e. DG emergency start lockout relay.)*

B. *Incorrect, the White light would NOT be off. Plausible because other white indicating lights are also used to indicate trouble in a circuit (i.e. control switch /device disagreement, motor trip out, etc.) and the expected condition would not be to have a problem.*

C. *Incorrect, the RED light would NOT be off. Plausible because other red lights are used to indicate breakers being open or circuits being de-energized. De-energizing a solenoid to cause a valve to come open is a commonly used fail-safe strategy for systems.*

D. *CORRECT, All 3 of the lights would be LIT. The Amber light indicates the circuit is energized, the White light indicates the electrical circuit has been initiated (solenoid energized to bleed pressure from the HPFP water control valve) and the Red light indicates water pressure sensed downstream of the flow control valve.*

Question No. 24

Tier 1 Group 2

K/A 067 AG2.1.31
Plant fire on site
Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.

Importance Rating: 4.6 / 4.3

Technical Reference: 1,2-45W626-1 R19

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200. HPFP B.4.h
Describe the following items for each major component in the Fire Protection Systems. h. Instrumentation and indication

Question Source:
Bank # __________
Modified Bank # _X________
New ________

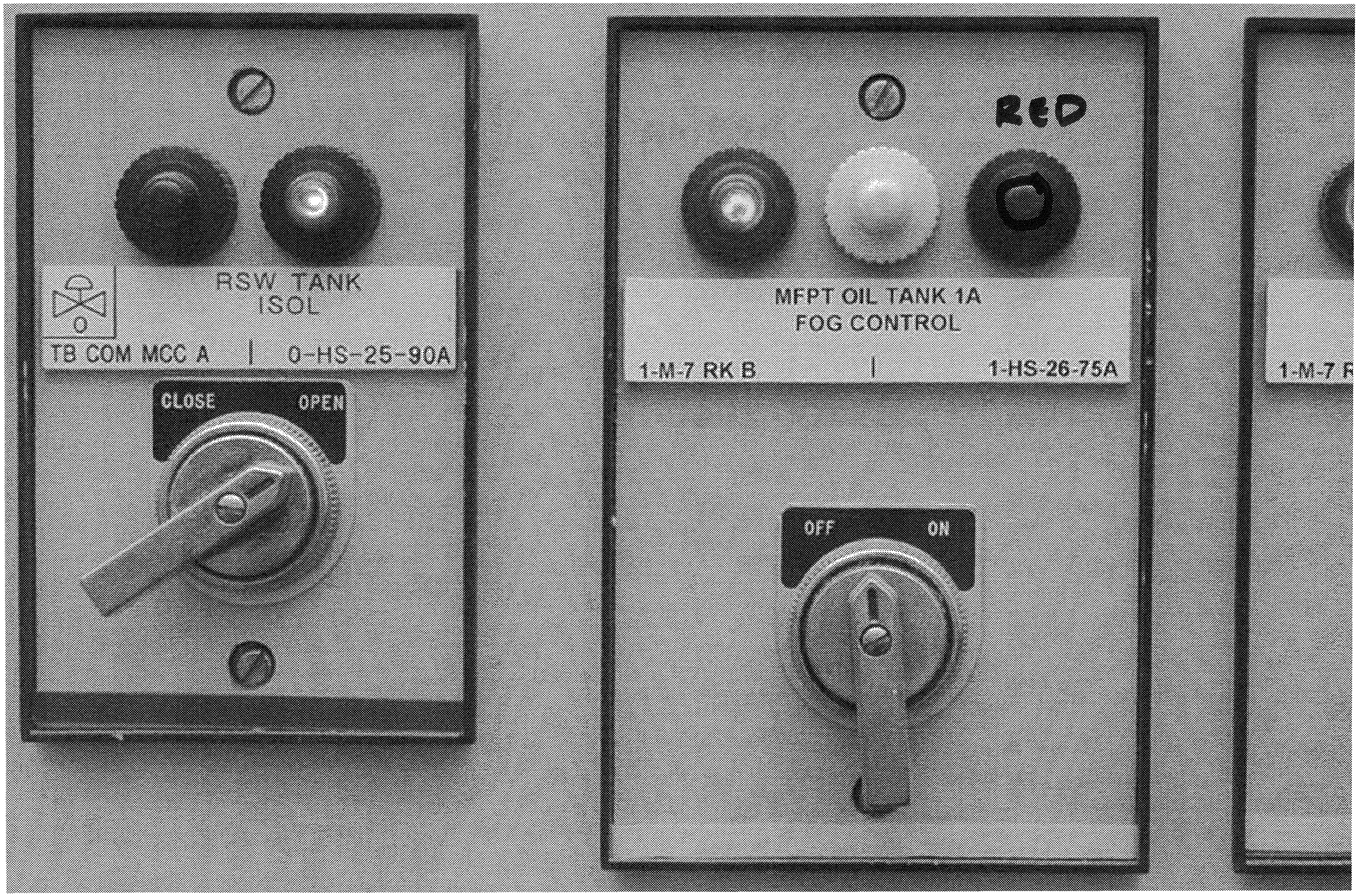
Question History: SQN bank question HPFP-B.4.E 001 modified

Question Cognitive Level:
Memory or fundamental knowledge _X_____
Comprehension or Analysis _______

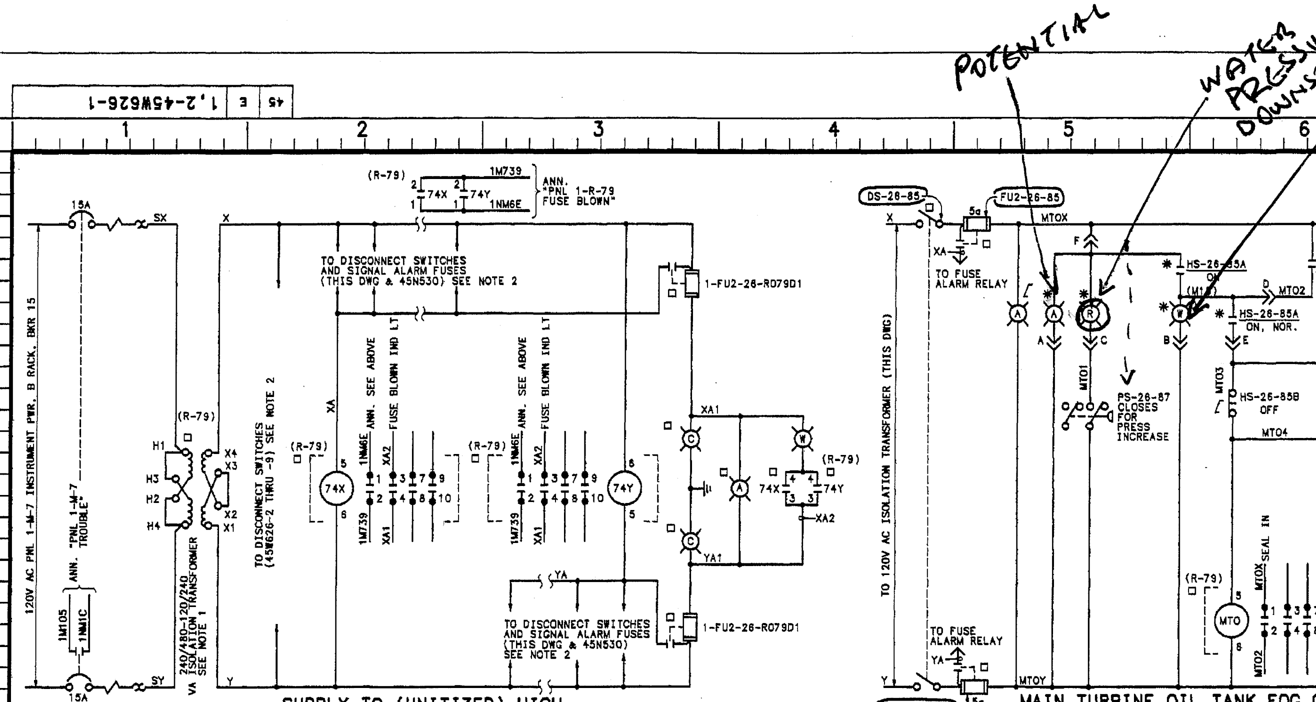
10 CFR Part 55 Content: (41.10 / 45.12)

10CFR55.43.b (n/a)

Comments: Modified SQN bank question HPFP-B.4.E 001


RSW TANK
ISOL
0
TB COM MCC A | 0-HS-25-90A
CLOSE
OPEN
RED
MFPT OIL TANK 1A
FOG CONTROL
1-M-7 RK B | 1-HS-26-75A
OFF
ON

45 | E | 1,2-45W626-1



SUPPLY TO (UNITIZED) HIGH PRESSURE FIRE PROTECTION SYSTEM
(UNIT 2 SIMILAR) SEE NOTE 2
(FOR UNIT 2 FUSE UNID. CHANGE THE UNIT #1 TO 2)

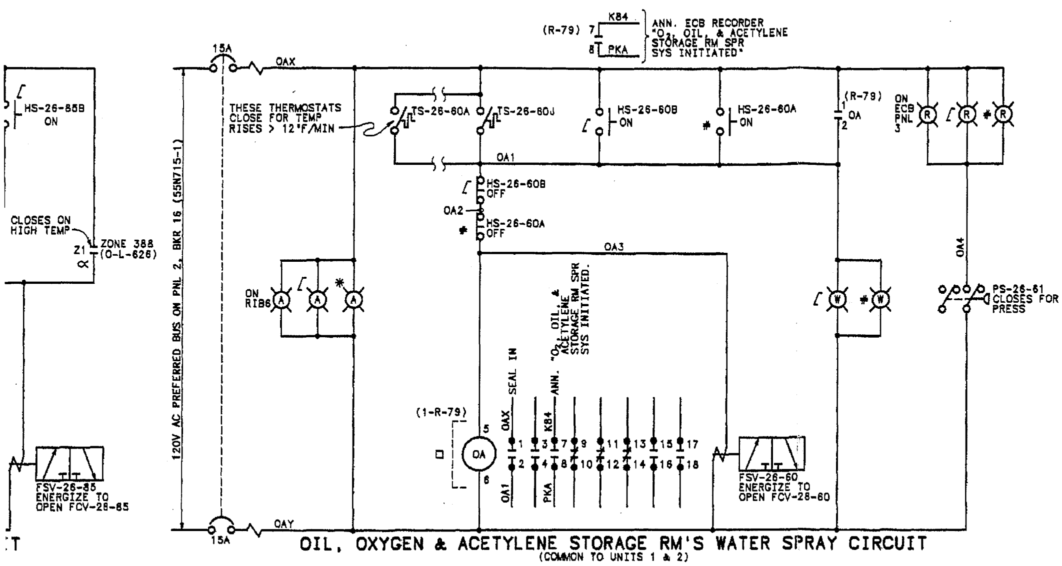
MAIN TURBINE OIL TANK FOG C…
(UNIT 2 SIMILAR)

FU2-26-85

FOG CIRCUIT	DISCONNECT SWITCH	FUSE NUMBER	SOLENOID VALVE	PRESSURE SWITCH	WIRE PREFIX & AUX RELAY	…
MAIN TURBINE OIL TANK	DS-26-85	FU2-26-85	FSV-26-85	PS-26-87	MTO	Z1;
TURBINE HEAD END	DS-26-82	FU2-26-82	FSV-26-82	PS-26-84	THE	Z3;
MAIN FEED PUMP TURB 1B OIL TK	DS-26-78	FU2-26-78	FSV-26-78	PS-26-80	MFTB	Z9;
MAIN FEED PUMP TURB 1A OIL TK	DS-26-75	FU2-26-75	FSV-26-75	PS-26-77	MFTA	Z4;
HYDROGEN SEAL OIL	DS-26-72	FU2-26-72	FSV-26-72	PS-26-74	HSO	Z2;

ADMIN CHANGE (TYP ALL BACKCIRCLES)

initiated



OIL, OXYGEN & ACETYLENE STORAGE RM'S WATER SPRAY CIRCUIT

(COMMON TO UNITS 1 & 2)

ZONE NO., & PNL NO. UNIT 2
Z10; 389; 626
Z12; 385; 626
Z14; 395; 626
Z13; 394; 626
Z3; 391; 632

WATER SPRAY CIRCUIT	SOLENOID VALVE	PRESSURE SWITCH	WIRE PREFIX & AUX RELAY	BKR NO.	TEMP SWITCHES (THERMOSTATS)	ECB RECORDER REC. PT.	ECB RECORDER WIRE NO.
OIL, OXYGEN, & ACETYLENE STORAGE ROOMS	FSV-26-60	PS-26-61	OA	16	TS-26-60A THRU J (9 SWITCHES) A,B,C OIL STORAGE ROOM D,E,F, OXYGEN STORAGE ROOM G,H,J ACETYLENE STORAGE ROOM	160	K84

NOTES:

1. TRANSFORMER IS CONNECTED 240/240 TO REDUCE MAGNETIZING INRUSH CURRENT, BUT IS USED 120/120 WHICH DERATES THE TRANS TO 750 VA.
2. THE TRANSFORMER LOCATED IN PANEL 1-R-79 POWERS UNIT 1 AND COMMON CIRCUITS. WHILE THE TRANSFORMER LOCATED IN PANEL 2-R-79 POWERS ONLY UNIT 2 CIRCUITS.
3. THIS DRAWING SUPERSEDES 45N626.

REFERENCE DRAWINGS:

47W610-26-SERIES ---- MECH LOGIC DIAGRAM
47W611-26-SERIES ---- MECH CONT DIAGRAM
45B640-1 ------------ SWITCH DEVELOPMENT INDEX
47W611-13-SERIES ---- MECH LOGIC DIAGRAM, DETECTION SYSTEM

SYMBOLS:

✱- DEVICES LOCATED ON UNIT CONTROL ROOM PANEL
□- DEVICES LOCATED ON MISC RELAY - RACK IN AUX INST ROOM, R-79
[- DEVICES LOCATED ON LOCAL CONTROL STATION
●- DEVICES (PUSHBUTTON) LOCATED NEAR ASSOCIATED EQUIPMENT (HOSE CONNECTIONS AND RACKS)
#- DEVICES LOCATED:
ON SERVICE BLDG LOADING DOCK FOR STG RMS.
AT COL SC-S2 FOR CARPENTER SHOP
∝- DEVICE LOCATED ON LOCAL INSTRUMENT PANEL.

REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
19	ADMIN CHANGE	DGR	DMD	HLS/DMD	
INC: ADMIN CHANGE PER RIMS: B37 010702 002					

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE CATEGORY 1

UNITS 1 & 2

WIRING DIAGRAM
HIGH PRESS. FIRE PROT SYS
SCHEMATIC DIAGRAMS SH-1

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
NUCLEAR ENGINEERING

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: M.T.WALKER	CHECKER: JLH - CMR	RO ISSUE PER: CCD RECONCILIATION SHEET NO.CCD-4264 DWG MADE A CCD FROM AC-EE & AO-19.	1 H.OBERHOLTZER
DESIGNER: N/A	REVIEWER: M.F.SCRUGGS		2 M.R.SEDLACIK
			3 D.Z.ROELIAT

ISSUED BY: J.B.HOSMER

DATE 6-21-88 | 45 | E | CCD NO:1,2-45W626-1 R19

CAD MAINTAINED DRAWING

CONTROL ROOM DWG

HPFP-B.4.E 001

1-HS-26-72A, H2 Seal Oil Unit Fog Control, is located on panel 1-M-15 in the Main Control Room. This deluge valve handswitch has red, white, and amber indicating lights on it.

Which ONE (1) of the following describes the function(s) of these indicating lights?

A.✓ A red light indicates the fog header is pressurized.

B. An amber light indicates the fog header is pressurized.

C. A white light indicates control power is available to the valve.

D. A red light indicates a manual or automatic actuation signal is present for the valve.

Justification:

Justification:

A. Correct. The red light indicates that the header downstream of FCV-26-72 is pressurized or the pressure switch has failed such that it indicates the header is pressurized.

B. Incorrect. An amber light indicates control power is available to the solenoid.

C. Incorrect. The white light indicates that a manual or auto actuation signal has been received to the solenoid; it does not indicate that the header is pressurized.

D. Incorrect. The red light indicates that the header downstream of FCV-26-72 is pressurized or the pressure switch has failed such that it indicates the header is pressurized.

Notes:

K/A {CFR}: 086A4.05 [3.0/3.5] {41.7}

References: 1,2-45N626-1

LP/Objectives: OPT200.HPFP, Obj 4.e

History: HLC 9809 Audit Exam
1/08 - Revised choices to simplify wording and improve plausibility; re-ordered based on length

Level: Low

Est Time: 3 min

Comments:

HLC 0108:	4/27/07	HLC 0109:	1/22/08
HLC 2006:	9/19/05	LOR Cycle Exam:	
Last Biennial Exam:		Part B (Y/N):	N
SRO only [Y/N]:	N	Category 8:	SYS 5

25. W/E08 EA1.1 025

Given the following:

- Unit 1 reactor tripped and a natural circulation cooldown was required.
- The LTOPs system was placed in service in accordance with ES-0.2, "Natural Circulation Cooldown".
- Subsequently, a faulted steam generator resulted in entry into FR-P.1, "Pressurized Thermal Shock".
- All RCS temperatures have been stabilized at approximately 290°F.
- RCS Pressure is 630 psig.
- Loop 1 Cold Leg Temperature fails LOW.

Which ONE (1) of the following describes the effect on the unit?

A. PORV PCV-68-334 will open and remain open unless it is manually closed.

B. PORV PCV-68-340 will open and remain open unless it is manually closed.

C. PORV PCV-68-334 will open until RCS pressure drops below the minimum LTOP setpoint.

D✓ PORV PCV-68-340 will open until RCS pressure drops below the minimum LTOP setpoint.

DISTRACTOR ANALYSIS:

The LTOP system is designed to open the PORVs to protect against a PTS condition and the question address a failure of the controls associated with automatic operation of the system. The PORVs are train dependent for the temperature and pressure inputs in LTOP mode. Only 1 PORV will operate on a channel failure. RCS Wide Range Thot and Tcold instruments on Loop 1 and Loop 2 input to 1-PCV-68-340 and the instruments on RCS Loops 3 and 4 input to 1-PCV-68-334.

A. Incorrect, The condition will cause 1-PCV-68-340 to open, not 1-PCV-68-334 and the valve will not require manual action to reclose. Plausible if the PORV identified to open is reversed and the PORV can be closed by placing the switch to manual but not the required action.

B. Incorrect, the Loop 2 instrument failure will cause 1-PCV-68-340 to fail open, but the valve will not require manual action to reclose. It will reclose when the pressure drops below the setpoint. Plausible because the correct PORV is identified to open but the PORV is not required to be closed by placing the switch to manual.

C. Incorrect, The instruments on RCS Loops 3 and 4 input to 1-PCV-68-334. The Loop 2 instrument failure will cause 1-PCV-68-340 to open, not 1-PCV-68-334. The valve reclosing when the pressure drops below setpoint is correct. Plausible if the PORV identified to open is reversed and the PORV reclosing automatically as the pressure drops below setpoint is correct.

D. CORRECT, Each PORV receives input from 2 loops temperatures and 1 WR pressure input. The associated pressure or temperature input will only cause 1 PORV to operate. In this case, pressure is high enough so that if the Tc failed low, a high pressure would be sensed, opening the associated PORV until it reaches minimum lift pressure, at which point it will reclose .

Question No. 25

Tier 1 Group 2

K/A W/E08 EA-1.1
Ability to operate and / or monitor the following as they apply to the (Pressurized Thermal Shock)
Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Importance Rating: 3.8 / 3.8

Technical Reference: 1-47W611-68-3
FR-P.1, Pressurizer Thermal Shock, Rev 13
ES-0.2, Natural Circulation Cooldown, Rev 15

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271FR-P.1 B.2.a
Discuss FR-P.1 entry conditions
a. Describe the setpoint., interlocks, and automatic actions associated with FR-P.1 entry conditions.

Question Source:
Bank # __X_______
Modified Bank # __________
New _______

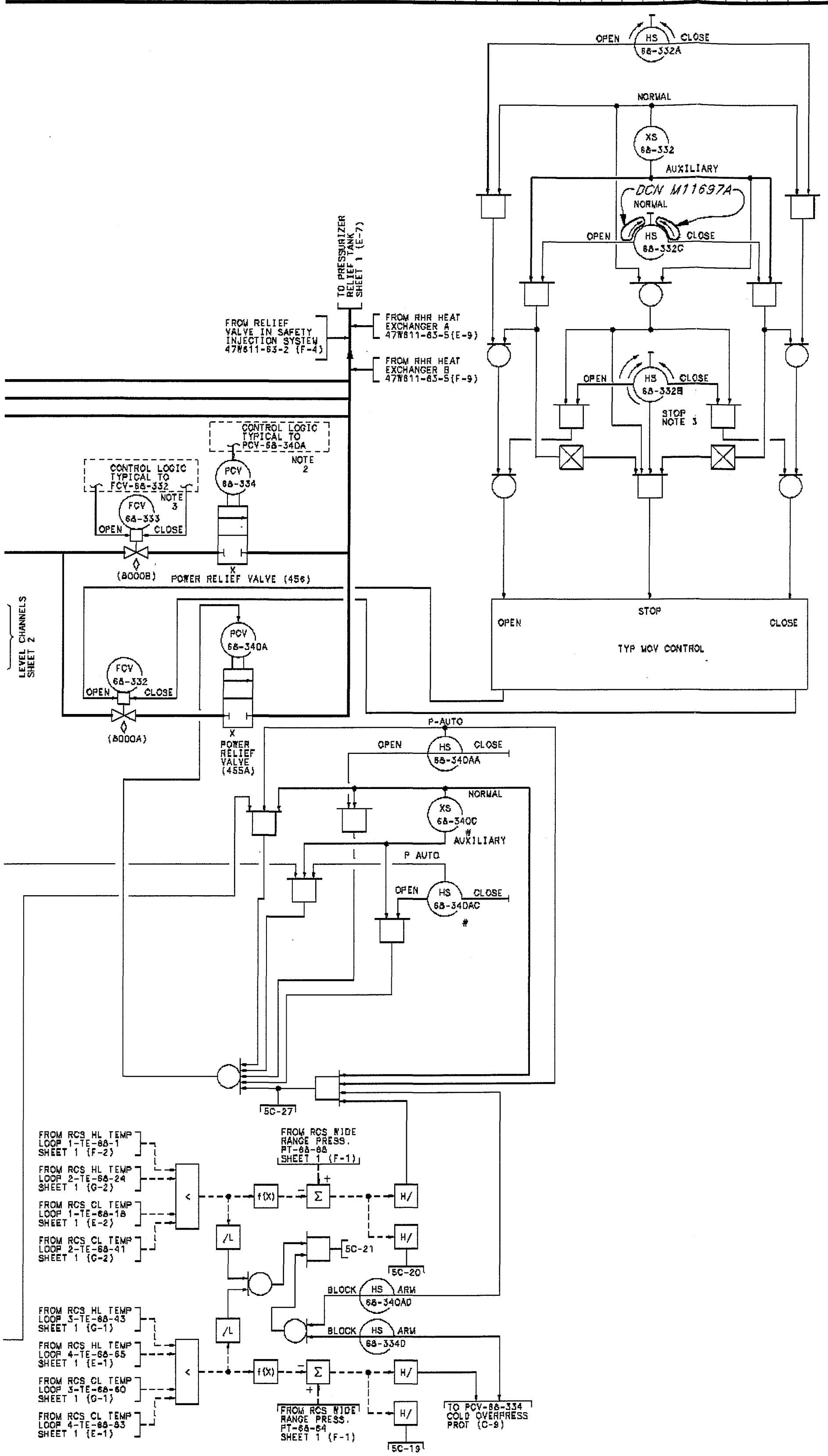
Question History: SQN Exam 1/2009,
SQN bank question PZR PRESS-B.12 005 with some modification including wording in stem and choices, rearranging location of correct answer, changing RCS with loop instrument failure.

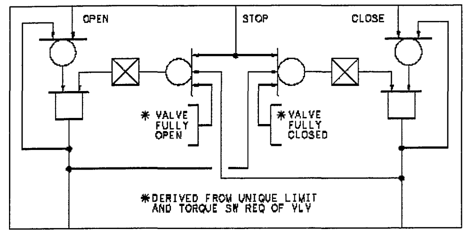
Question Cognitive Level:
Memory or fundamental knowledge ______
Comprehension or Analysis __X____

10 CFR Part 55 Content: (41.7 / 45.5 / 45.6)

10CFR55.43.b (n/a)

Comments: SQN bank question with distractor modifications.





TYPICAL MOV CONTROL

NOTES:

1. FOR SYMBOLS AND GENERAL NOTES SEE SHEET 1.
2. EXCEPT FOR INSTRUMENT NUMBERS & ANNUNCIATOR WINDOW 5C-27 WHICH IS 5C-26 FOR PCV-68-334.
3. DISCONNECT HS-68-332B & 333B. THESE HANDSWITCHES ARE DISCONNECTED BECAUSE CIRCUIT INTEGRITY MAY BE COMPROMISED BY A POSSIBLE LOCA.
4. DIGITAL AND ANALOG LOGIC SYMBOLS ARE USED ON LOGIC DIAGRAMS TO FUNCTIONALLY DESCRIBE THE PROCESS CONTROL. REFER TO THE ASSOCIATED WIRING SCHEMATIC FOR THE ELECTRICAL COMPONENTS USED TO IMPLEMENT THE CONTROL SCHEME.

REFERENCE DRAWINGS:

45W668-1 ------------- SCHEMATIC DIAGRAM
45N779-41 ------------ SCHEMATIC DIAGRAM
45N657-7 & 15 -------- SCHEMATIC DIAGRAMS
45W657-28------------- SCHEMATIC DIAGRAM
45N662-2 ------------- SCHEMATIC DIAGRAM
CONTRACT 91934
1080273, SHTS 5 & 6 -- WESTINGHOUSE PROCESS CONTROL DAIGRAM
5655026, SH. 11 ------ WESTINGHOUSE FUNCTIONAL DAIGRAM
1-34597-CD-20, SH. 4 - FOXBORO WIRING DAIGRAM
1-34597-CD-17, SH. 5 - FOXBORO WIRING DAIGRAM

COMPANION DRAWINGS:

47W611-68-1 & 2

FOR ORIGINAL INFORMATION IN TITLE BLOCK SEE REVISION 0 MICROFILM COPY.

REV	ECN/DCN	CHG DOC	DRWN	CHKD	APPD	DATE
1	DCN M11697A	N/A	GMB			

INC: DCA'S M11697-111 R0 AND -485A R0. ALSO ADDED MISCELLANEOUS NOTE.

SCALE: NONE EXCEPT AS NOTED

REACTOR BUILDING CATEGORY 1
UNIT 1

MECHANICAL LOGIC DIAGRAM REACTOR COOLANT SYSTEM

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
NUCLEAR ENGINEERING

Q

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: JOHN AVITT	CHECKER: SEE R0	R0 ISSUE PER: CCD REQ SHEET NO. 7092. DRAWING MADE A CCD FROM AD-R11. INCORP DCA E-1-MD0531-A-47W611-68-3-A01-000 PER WORKPLAN MD0531A-02 AND DCN MD0531A.	1 SEE R0
			2 SEE R0
DESIGNER: N/A	REVIEWER: SEE R0		3 SEE R0

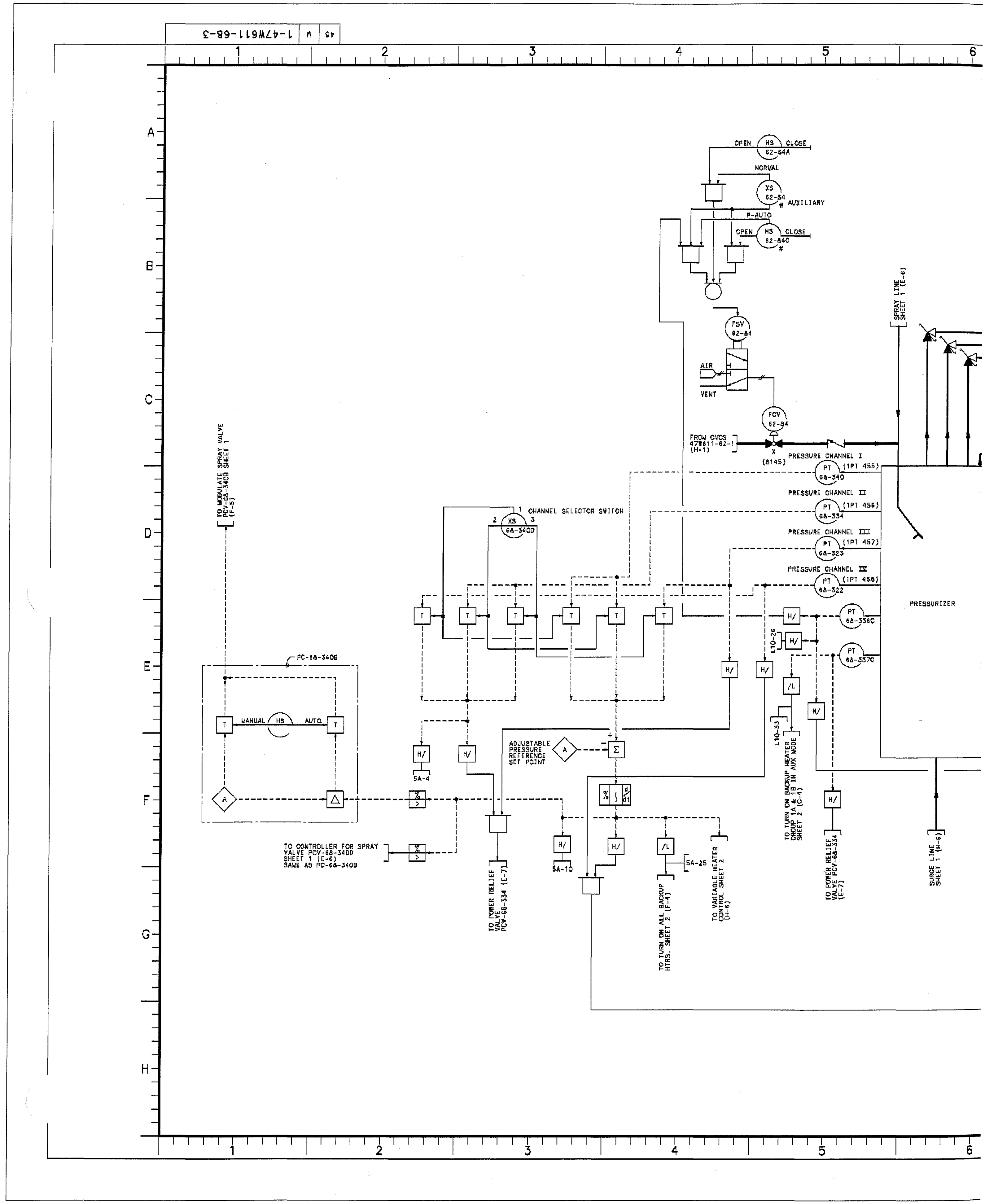
DATE 2-2-89 | 45 | M | CCD NO: 1-47W611-68-3 R1

ISSUED BY: SEE R0

FSAR

DRAWING SERVICES UNIT
CAD MAINTAINED DRAWING
THIS CONFIGURATION CONTROL DRAWING IS MAINTAINED BY THE SQN CAD UNIT AND IS NOW PART OF THE TVA CADAM DATABASE.
COMPUTER GRAPHICS

CONTROL ROOM DWG



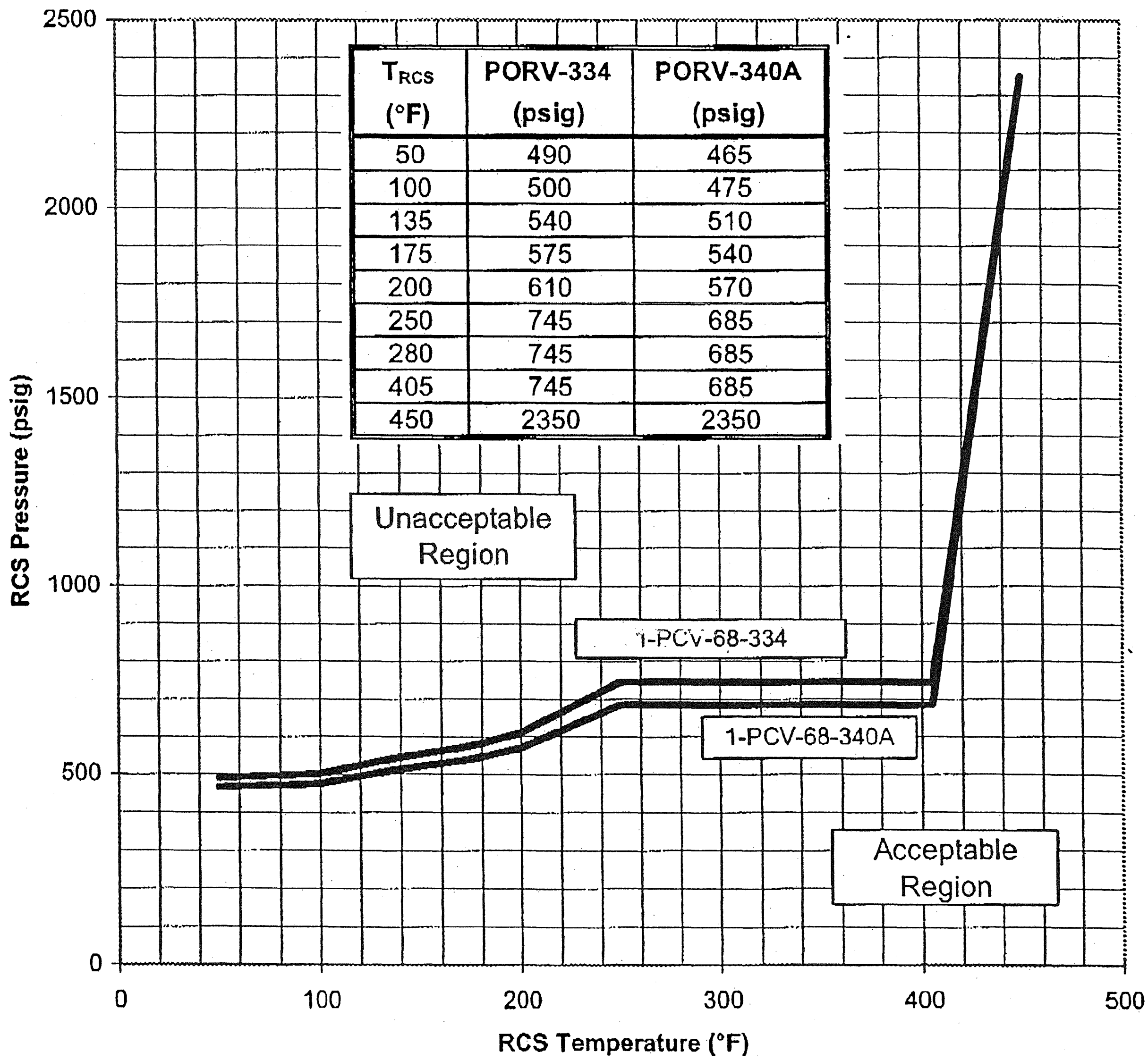
1-47W611-68-3
OPEN HS 62-84A CLOSE
NORMAL
XS 62-84 AUXILIARY
P-AUTO
OPEN HS 62-840 CLOSE
FSV 62-84
AIR
VENT
FCV 62-84
FROM CVCS 47W611-62-1 (H-1)
(8145)
SPRAY LINE SHEET 1 (E-6)
PRESSURE CHANNEL I
PT 68-340 (1PT 455)
PRESSURE CHANNEL II
PT 68-334 (1PT 456)
PRESSURE CHANNEL III
PT 68-323 (1PT 457)
PRESSURE CHANNEL IV
PT 68-322 (1PT 458)
PT 68-336C
PT 68-337C
PRESSURIZER
CHANNEL SELECTOR SWITCH
XS 68-340D
TO MODULATE SPRAY VALVE PCV-68-340B SHEET 1 (F-5)
PC-68-340B
MANUAL HS AUTO
ADJUSTABLE PRESSURE REFERENCE SET POINT
5A-4
5A-10
5A-25
L10-26
L10-33
TO CONTROLLER FOR SPRAY VALVE PCV-68-340D SHEET 1 (E-6) SAME AS PC-68-340B
TO POWER RELIEF VALVE PCV-68-334 (E-7)
TO TURN ON ALL BACKUP HTRS. SHEET 2 (F-4)
TO VARIABLE HEATER CONTROL SHEET 2 (H-6)
TO TURN ON BACKUP HEATER GROUP 1A & 1B IN AUX MODE SHEET 2 (C-4)
TO POWER RELIEF VALVE PCV-68-334 (E-7)
SURGE LINE SHEET 1 (H-6)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
25.	**DETERMINE** if LTOPS should be placed in service:	
	a. **CHECK** RCS temperature less than 350°F.	a. **GO TO** Step 15.
	b. **CHECK** RCS pressure less than LTOPS setpoint. (Curve 5 or 6)	b. **GO TO** Step 15.
	c. **EVALUATE** placing operable LTOPS channel(s) in service.	
	d. **WHEN** LTOPS armed, **THEN** **MAINTAIN** RCS pressure less than LTOPS setpoint.	
26.	**DETERMINE** if RHR should be placed in service:	
	a. **CHECK** the following: • RCS temperature less than 350°F **AND** • RCS pressure less than 350 psig.	a. **GO TO** Step 15.
	b. **PLACE** RHR in service **USING** EA-74-1, Placing RHR Shutdown Cooling in Service.	

CURVE 3

Unit 1 LTOPS Setpoint Curves

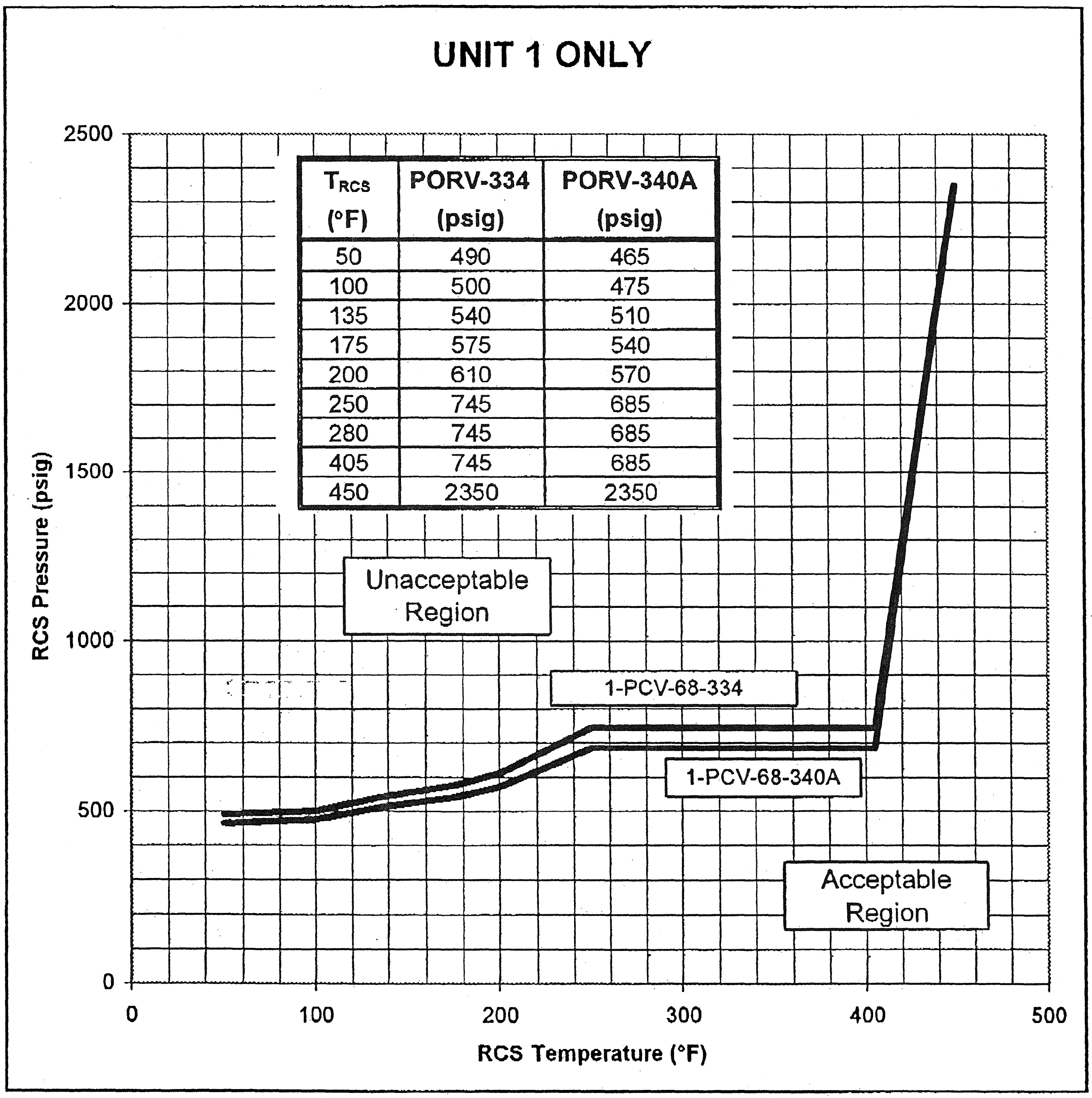
UNIT 1 ONLY



T_{RCS} (°F)	PORV-334 (psig)	PORV-340A (psig)
50	490	465
100	500	475
135	540	510
175	575	540
200	610	570
250	745	685
280	745	685
405	745	685
450	2350	2350

CURVE 5

Unit 1 LTOPS Setpoint Curves



T_{RCS} (°F)	PORV-334 (psig)	PORV-340A (psig)
50	490	465
100	500	475
135	540	510
175	575	540
200	610	570
250	745	685
280	745	685
405	745	685
450	2350	2350

PZR PRESS-B.12 005

Given the following:

- RCS temperatures are ~300°F
- RCS pressure is 600 psig
- All systems are aligned normal for plant conditions

Which ONE (1) of the following describes the plant response if Loop 2 Cold Leg Temperature fails LOW?

A.✓ PCV-68-340 will open until RCS pressure decreases to the LTOP setpoint.

B. PCV-68-334 will open until RCS pressure decreases to the LTOP setpoint.

C. Both PORVs will open until RCS pressure decreases to within 20 psig of the LTOP setpoint.

D. RCS TEMP LOW, ARM COPS alarm will annunciate.

I. **PROGRAM:** OPERATOR TRAINING - LICENSED

II. **COURSE:** LICENSE TRAINING

III. **LESSON TITLE:** FR-P.1, PRESSURIZED THERMAL SHOCK

IV. **LENGTH OF LESSON/COURSE:** 1 hours

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate or explain, using classroom evaluations and/or simulator scenarios, the requirements of the FR-P.1, Pressurized Thermal Shock.

B. Enabling Objectives

0.	Demonstrate an understanding of NUREG 1122 Knowledge's and Abilities associated FR-P.1, Pressurized Thermal Shock, that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate license position as identified in Appendix A.
1.	Explain the purpose/goal of FR-P.1.
2.	Discuss the FR-P.1 entry conditions. a. Describe the setpoints, interlocks, and automatic actions associated with FR-P.1 entry conditions. b. Describe the requirements associated with FR-P.1 entry conditions.
3.	Summarize the mitigating strategy for the failure that initiated entry into FR-P.1.
4.	Describe the bases for all limits, notes, cautions, and steps of FR-P.1.
5.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.
6.	Given a set of initial plant conditions use FR-P.1 to correctly: a. Identify required actions b. Respond to Contingencies c. Observe and Interpret Cautions and Notes
7.	Apply GFE and system response concepts to the performance of FR-P.1 conditions.

26. W/E10 EK 1.1 026

Given the following:

- Unit 1 experienced a reactor trip and loss of offsite power.
- The crew is performing ES-0.4, Natural Circulation Cooldown With Steam Void in Vessel (Without RVLIS).

While performing RCS depressurization steps in ES-0.4, which ONE of the following explains a function served by using the Pressurizer heaters to repressurize the RCS by 100 psig when Pressurizer level exceeds 90%?

A.✓ Promotes heat removal from the upper head region of the vessel by collapsing the steam void.

B. Maintains Pressurizer conditions that allow restarting the Reactor Coolant Pumps when power is restored.

C. Facilitates pressure control by ensuring the Pressurizer is maintained at saturated conditions.

D. Allows transfer of the upper head void into the RCS hot legs where the RCS subcooled mass will collapse the void.

<u>*DISTRACTOR ANALYSIS:*</u>

A. CORRECT, Raising the pressure by 100 psig will lower the pressurizer level, collapse head voids, and assist in cooling the upper head. This allows the depressurization to continue. This is identified in a note in ES-O.4. Collapsing the head voids allows the vessel level to rise.

B. Incorrect, ES-0.4 directs the pressurizer level to be raised to >90% to allow the restart of an RCP. Plausible because 90% is the level associated with conditions required prior to starting a RCP during performance of ES-0.4.

C. Incorrect, Maintaining the pressurizer at saturated conditions does make pressure easier to control as identified in ES-0.4 but this is not the function of repressurizing during the depressurization steps in the procedure. Plausible because maintaining the pressurizer at saturated conditions does make pressure easier to control.

D. Incorrect, Transferring the voids out of the head and into the RCS hot legs would provide for collapsing the voids but this is not the function of repressurizing during the depressurization steps in the procedure. Plausible because the action described would cause the collapse of voids.

Question No. 26

Tier 1 Group 2

K/A W/E10 EK 1.1
Knowledge of the operational implications of the following concepts as they apply to the (Natural Circulation with Steam Void in Vessel with/without RVLIS): Components, capacity, and function of emergency systems.

Importance Rating: 3.3 / 3.6

Technical Reference: ES-0.4, " Natural Circulation Cooldown with Steam Void in Vessel (Without RVLIS) Rev 3

Proposed references to be provided to applicants during examination: None

Learning Objective: OPL271ES-0.4 B.4
Summarize the mitigating strategy for the failure that initiated entry into ES-0.4.

Question Source:
Bank # __________
Modified Bank # __X_______
New ________

Question History: WBN question EOP0000.20 001 modified

Question Cognitive Level:
Memory or fundamental knowledge _X______
Comprehension or Analysis _______

10 CFR Part 55 Content: (41.8 / 41.10 / 45.3)

10CFR55.43.b (n/a)

Comments: WBN question EOP0000.20 001 modified

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE Raising RCS pressure by 100 psi when pressurizer level exceeds 90% collapses head voids, lowers pressurizer level, and assists in cooling upper head. This will allow RCS depressurization to be resumed.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
12.	**CHECK** pressurizer level less than 90%.	**RAISE** RCS pressure by 100 psi **USING** pressurizer heaters. **GO TO** Note prior to Step 11.
13.	**MONITOR** if CLAs should be isolated:	
	a. **CHECK** RCS pressure less than 1000 psig.	a. **PERFORM** the following: 1) **WHEN** RCS pressure is less than 1000 psig, **THEN** **PERFORM** Substep 13.b. 2) **GO TO** Step 14.
	b. **ISOLATE** CLAs: 1) **DISPATCH** personnel to restore power to CLA isolation valves **USING** EA-201-1, 480V Board Room Breaker Alignments. 2) **CLOSE** CLA isolation valves. 3) **NOTIFY** local personnel to remove power to CLA isolation valves **USING** EA-201-1, 480 V Board Room Breaker Alignments.	

EOP Step Number: 12

CHECK pressurizer level less than 90%.

ERG Step Number: 9

Check PRZR Level - LESS THAN 90%

Purpose:

To ensure the pressurizer level has not exceed 90% before continuing the RCS cooldown and depressurization.

ERG Basis:

The pressurizer is being allowed to fill with primary fluid displaced by the growing vessel void. However, the size of the void is being limited by only allowing the pressurizer to fill to a maximum of 90% (starting at a level above the top of the heaters). This will ensure continued pressurizer pressure control. The document RCP TRIP/RESTART in the Generic Issues section of the Executive Volume provides a discussion of the plant specific pressurizer level necessary to accommodate upper head void collapse in relation to RCP restart conditions. In addition, information is provided on the percentage of pressurizer volume displaced by vessel voiding (limited to above the top of the hot leg nozzles) for various types of plants. This information can be used to approximate the expected increase in pressurizer level from upper head void growth when the RCS is cooled down and depressurized as outlined in this guideline.

If the pressurizer level increases to greater than 90% during the depressurization, the RCS is repressurized to enhance upper head cooling (Refer to BASIS section of previous NOTE) before any further depressurization can be performed.

EOP Basis:

Same.

Deviation:

None.

Justification:

N/A

Setpoint:

None.

QUESTIONS REPORT

for BANK WBN Questions MARCH 2007

EOP0000.20 001

Which ONE of the following correctly explains the BASIS for alternately depressurizing and pressurizing the RCS by 100 psi when upper head voiding is indicated during the performance of ES-0.4, "Natural Circulation Cooldown with Steam Void in Vessel (Without RVLIS)"?

a. Allows gradual transfer of the upper head void from the head down into the RCS hot legs where the subcooled mass of the RCS will collapse the void.

b. Allows time for the upper head to cool via the CRDM cooling fans or by natural convection flow to the CNTMT atmosphere.

c. Allows more ECCS flow during the depressurization in order to cool the RCS and upper head region of the vessel.

d.✔ Allows heat removal from the upper head region of the vessel by cycling vessel level as the bubble alternately expands and contracts.

The correct answer is D

Reference:	ES-0.4	K/A Number:	E10 EK1.2
K/A Value:	3.4/3.6	Last Used:	WK53 0301
Level:		Source:	
Tier/Grp:		SRO Only:	

I. PROGRAM: OPERATOR TRAINING - LICENSED

II. COURSE: LICENSE TRAINING

III. LESSON TITLE: ES-0.4, "Natural Circulation Cooldown with Steam Void in Vessel (Without RVLIS)"

IV. LENGTH OF LESSON/COURSE: 1 hour(s)

V. TRAINING OBJECTIVES:

A. Terminal Objective:

Upon completion of License Training, the participant shall be able to demonstrate or explain, using classroom evaluations and/or simulator scenarios, the requirements of ES-0.4, Natural Circulation Cooldown with Steam Void in Vessel (Without RVLIS).

B. Enabling Objectives

0.	Demonstrate an understanding of NUREG 1122 Knowledge's and Abilities associated with Natural Circulation Cooldown with Steam Void in Vessel (Without RVLIS) that are rated ≥ 2.5 during Initial License Training and ≥ 3.0 during License Operator Requalification Training for the appropriate license position as identified in Appendix A.
1.	Explain the purpose/goal of ES-0.4.
2.	Discuss the ES-0.4 entry conditions. a. Describe the setpoints, interlocks, and automatic actions associated with ES-0.4 entry conditions. b. Describe the requirements associated with ES-0.4 entry conditions.
3.	Summarize the mitigating strategy for the failure that initiated entry into ES-0.4.
4.	Describe the bases for all limits, notes, cautions, and steps of ES-0.4.
5.	Describe the conditions and reason for transitions within this procedure and transitions to other procedures.
6.	Given a set of initial plant conditions use ES-0.4 to correctly: a. Identify required actions b. Respond to Contingencies c. Observe and Interpret Cautions and Notes
7.	Apply GFE and system response concepts to the performance of ES-0.4 conditions.

27. WE14 EK2.1 027

Which one of the following states interlocks that must be met before valve FCV-72-23 (Train A Containment Spray Suction from Containment Sump) can be opened?

A. Both FCV-74-3 (RHR Suction from RWST) closed and FCV-72-40 (RHR Discharge to RHR Spray) must be closed.

B. Both FCV-72-40 (RHR Discharge to RHR Spray) and FCV-72-34 (Containment Spray Pump Recirc) must be closed.

C✓ Both FCV-72-22 (Containment Spray Suction from RWST) and FCV-74-3 (RHR Suction from RWST) must be closed.

D. Both FCV-72-34 (Containment Spray Pump Recirc) and FCV-72-22 (Containment Spray Suction from RWST) must be closed.

DISTRACTOR ANALYSIS:

A. Incorrect, FCV-74-3 is interlocked but FCV-72-40 is not interlocked with opening FCV-72-23. Plausible because FCV-72-3 is correct and FCV-72-40 is interlocked with other valves associated with sump swapover.

B. Incorrect, FCV-72-40 and FCV-72-34 are not interlocked with opening FCV-72-23. Plausible because both FCV-72-40 and FCV-72-34 are a containment spray valves. Other pump recirc valves do have interlocks in transferring to the containment sump and. FCV-72-40 is interlocked with other valves associated with sump swapover.

C. CORRECT, Both FCV-72-22 (Containment Spray Suction from RWST) and FCV-74-3 (RHR Suction from RWST) must be closed as shown on print 1-47W611-72-1.

D. Incorrect, FCV-72-34 is not interlocked with opening FCV-72-23. Plausible because the FCV-72-34 is a containment spray valve and other pump recirc valves do have interlocks in transferring to the containment sump.

Question No. 27

Tier 1 Group 2

K/A WE14 EK2.1
Knowledge of the interrelations between the (High Containment Pressure) and the following:
Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Importance Rating: 3.4 /3.7

Technical Reference:

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200CS B.4.g
Describe the following items for each major component in the CS system as described in this lesson:
g. Interlocks including setpoints

Question Source:
Bank __X_______
Modified Bank _________
New _______

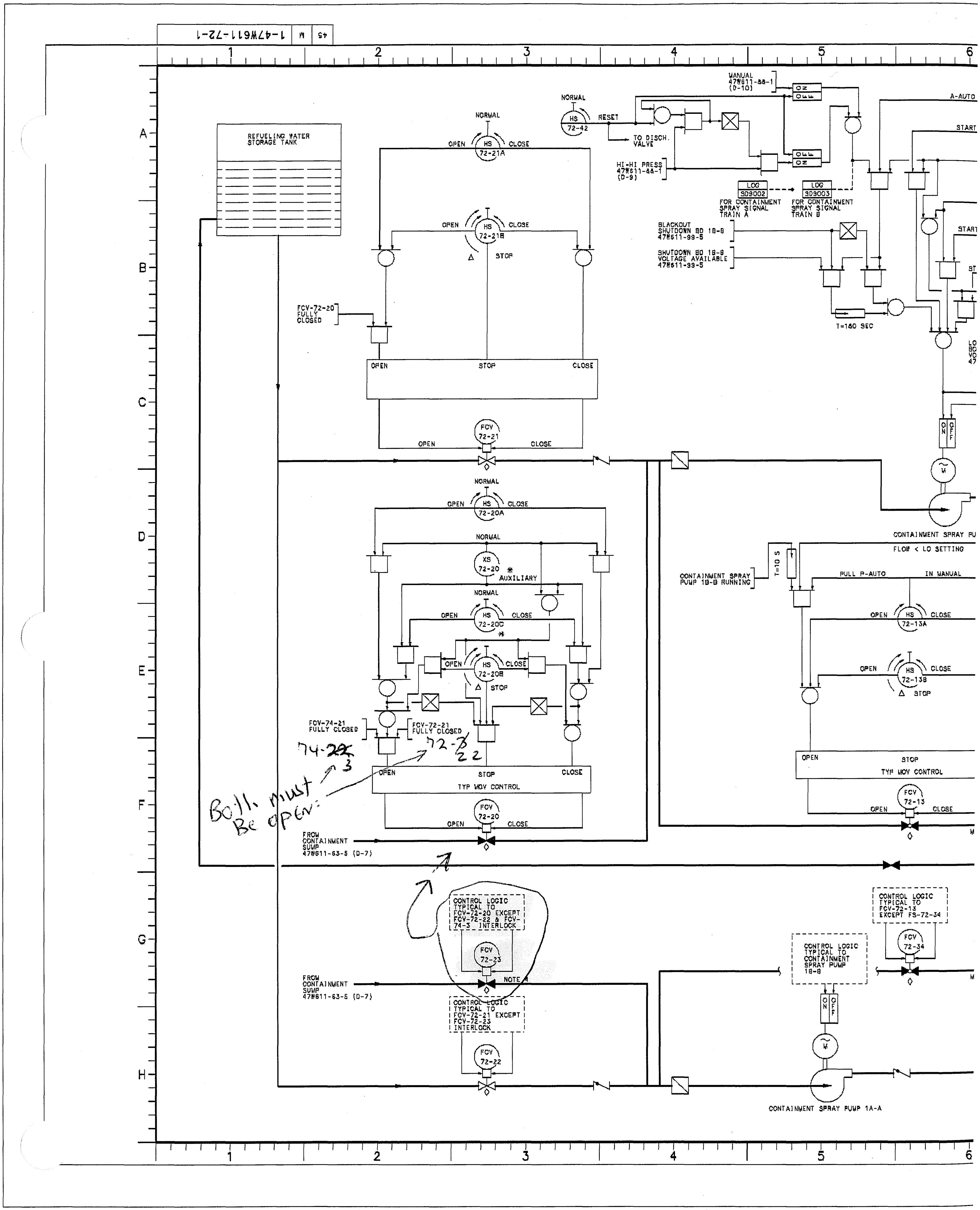
Question History: SQN Bank Question CSS 002

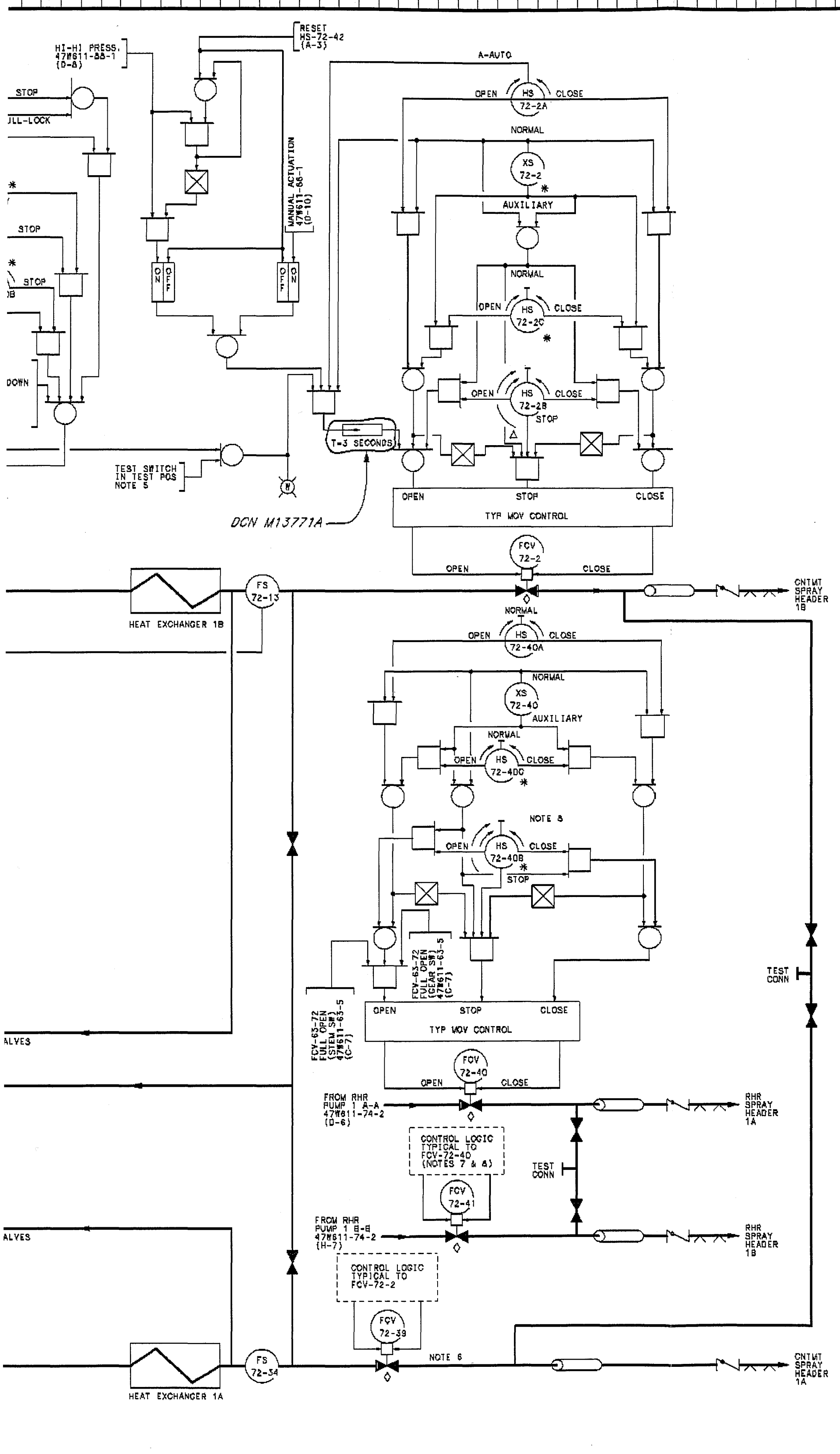
Question Cognitive Level:
Memory or fundamental knowledge __X_____
Comprehension or Analysis _______

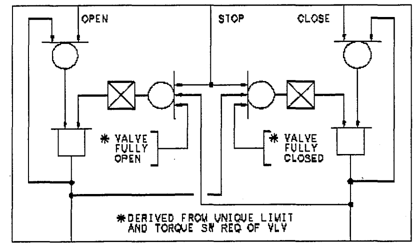
10 CFR Part 55 Content: (41.7 / 45.7)

10CFR55.43.b (n/a)

Comments: SQN Bank Question CSS 002 with correct answer relocated andboth distractors changed for increased plausiblity by using each of the valves twice versus using some of the valves in distractors only once.


1-47W611-72-1
M
45
REFUELING WATER STORAGE TANK
NORMAL
OPEN HS 72-21A CLOSE
OPEN HS 72-21B CLOSE
STOP
FCV-72-20 FULLY CLOSED
OPEN STOP CLOSE
FCV 72-21
OPEN CLOSE
NORMAL
HS 72-42
RESET
TO DISCH. VALVE
MANUAL 47W611-88-1 (D-10)
ON OFF
OFF ON
HI-HI PRESS 47W611-88-1 (D-9)
LOG SD9002 FOR CONTAINMENT SPRAY SIGNAL TRAIN A
LOG SD9003 FOR CONTAINMENT SPRAY SIGNAL TRAIN B
BLACKOUT SHUTDOWN BD 1B-B 47W611-99-5
SHUTDOWN BD 1B-B VOLTAGE AVAILABLE 47W611-99-5
T=180 SEC
A-AUTO
START
CONTAINMENT SPRAY PU
OPEN HS 72-20A CLOSE
XS 72-20 AUXILIARY
OPEN HS 72-20C CLOSE
OPEN HS 72-20B CLOSE
STOP
FCV-74-21 FULLY CLOSED
FCV-72-21 FULLY CLOSED
74-~~22~~ 3
72-~~3~~ 22
Both must Be open
OPEN STOP CLOSE
TYP MOV CONTROL
FCV 72-20
OPEN CLOSE
FROM CONTAINMENT SUMP 47W611-63-5 (D-7)
FLOW < LO SETTING
CONTAINMENT SPRAY PUMP 1B-B RUNNING
T=10 S
PULL P-AUTO
IN MANUAL
OPEN HS 72-13A CLOSE
OPEN HS 72-13B CLOSE
STOP
OPEN STOP
TYP MOV CONTROL
FCV 72-13
OPEN CLOSE
CONTROL LOGIC TYPICAL TO FCV-72-20 EXCEPT FCV-72-22 & FCV-74-3 INTERLOCK
FCV 72-23
NOTE 4
FROM CONTAINMENT SUMP 47W611-63-5 (D-7)
CONTROL LOGIC TYPICAL TO FCV-72-21 EXCEPT FCV-72-23 INTERLOCK
FCV 72-22
CONTROL LOGIC TYPICAL TO FCV-72-13 EXCEPT FS-72-34
FCV 72-34
CONTROL LOGIC TYPICAL TO CONTAINMENT SPRAY PUMP 1B-B
ON OFF
CONTAINMENT SPRAY PUMP 1A-A





TYPICAL MOV CONTROL

NOTES:

1. FOR SYMBOLS OTHER THAN THOSE NOTED BELOW, SEE INSTRUMENTATION AND IDENTIFICATION STANDARDS, LATEST ISSUE.
2. FOR COMPLETE INSTRUMENTATION AND COMPONENT SEPARATION DESIGNATIONS SEE CONTROL DIAGRAM, 47W610-72-1.
3. NUMBERS IN PARENTHESIS ARE WESTINGHOUSE INSTRUMENT NUMBERS.
4. FCV-72-23 IS INTERLOCKED BY FCV-72-22 AND FCV-74-3. FCV-72-23 MUST BE FULLY CLOSED BEFORE FCV-72-22 MAY BE OPENED.
5. THIS VALVE TEST SWITCH CONTACT BYPASSES THE SPRAY PUMP INTERLOCK AND PERMITS TESTING OF THE SPRAY VALVE WITHOUT THE PUMP RUNNING.
6. HS-72-43 IS THE RESET SWITCH FOR FCV-72-39.
7. FCV-72-41 IS INTERLOCKED BY FCV-63-73.
8. HS-72-40B & 41B ARE DISCONNECTED DUE TO THEIR LACK OF ENVIRONMENTAL QUALIFICATION.
9. DIGITAL AND ANALOG LOGIC SYMBOLS ARE USED ON LOGIC DIAGRAMS TO FUNCTIONALLY DESCRIBE THE PROCESS CONTROL. REFER TO THE ASSOCIATED WIRING SCHEMATIC FOR THE ELECTRICAL COMPONENTS USED TO IMPLEMENT THE CONTROL SCHEME.

SYMBOLS:

* -------- LOCATED ON ELECTRICAL SWITCHGEAR
# -------- LOCATED IN AUXILIARY CONTROL ROOM
▲ -------- TEST SWITCH
△ -------- LOCAL CONTROL SWITCH

REFERENCE DRAWINGS:

47W611-0-1 & 2 -------------- LOGIC DIAGRAM INDEX & SYMBOLS
47W610-72-1 ---------------- CONTROL DIAGRAM
47W812-1 ------------------- FLOW DIAGRAM
45N779-8, 10, 25, & 28 ------ SCHEMATIC DIAGRAMS
45N765-7 ------------------- SCHEMATIC DIAGRAM

PUN

FOR ORIGINAL INFORMATION IN TITLE BLOCK SEE REVISION 0 MICROFILM COPY.

REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
9	DCN M13771A	DGR			
INC: DCA-M13771-03102 R0 AND -04102 R0					

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE
UNIT 1
CATEGORY 1

MECHANICAL LOGIC DIAGRAM CONTAINMENT SPRAY SYSTEM

SEQUOYAH NUCLEAR PLANT

TENNESSEE VALLEY AUTHORITY
NUCLEAR ENGINEERING

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: M.T.WALKER	CHECKER: E.MATTHEWS	R0 ISSUE PER: CCD REC SHEET NO. 7133. DRAWING MADE A CCD FROM AD-15.	1. B.PAJ
DESIGNER: N/A	REVIEWER: P.A.LUNN		2. M.R.SEDLACIK
			3. WILLIAM MUELLER

DATE 2-2-89	45	M	CCD NO: 1-47W611-72-1	R9

ISSUED BY: P.G.TRUDEL

DRAWING SERVICES UNIT
PROCAD MAINTAINED DRAWING
THIS CONFIGURATION CONTROL DRAWING IS MAINTAINED BY THE SQN CAD UNIT AND IS PART OF THE TVA PROCADAM DATABASE.
COMPUTER GRAPHICS

CONTROL ROOM DWG

QUESTIONS REPORT
for Copy of LICENSED OPERATOR TEST QUESTIONS

CSS 002

Which one of the following states the interlocks that must be satisfied before valve FCV-72-23 (Containment Spray Suction from Containment Sump) ("A" train) can be opened?

A. FCV-63-72 (RHR Suction from Containment Sump) open, and FCV-72-22 (Containment Spray Suction from RWST) closed.

B.✓ FCV-72-22 (Containment Spray Suction from RWST) closed, and FCV-74-3 (RHR Suction from RWST) closed.

C. FCV-72-40 (RHR Discharge to RHR Spray) closed, and Safety Injection pump miniflow valves 63-3 or 63-4 and 63-175 closed.

D. FCV-74-3 (RHR Suction from RWST) closed, and FCV-63-72 (RHR Suction from Containment Sump) open.

Per 1,2-47W-611-72-1, both FCV-72-22 and FCV-74-3 must be CLOSED (and FCV-72-23 HS taken to Open position) to make up the AND Gate to open FCV-72-23.

K/A: 026 K4.08 (4.1-4.3) 41.7

Reference: 1,2-47W-611-72-1
0-45N779-25

Objective: OPL271C024, B.5

History: Old Bank Number PL-1063
Reviewed 9/18/02, WDD

Level: Comprehension

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** CONTAINMENT SPRAY SYSTEM

IV. **LENGTH OF LESSON:** Initial License Training: 2 ½ hour lecture; 1 hour simulator demonstration; 1 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:

Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Containment Spray systems (CS) in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with the CS system that are rated ≥ 2.5 during Initial License training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the CS as described in the SQN FSAR.
2. State the design basis of the CS system in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the CS system as illustrated on the simplified system drawing.
4. Describe the following items for each major component in the CS system as described in this lesson:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the CS system components are designed
   m. Location of controls and indications associated with the CS system in the control room and auxiliary control room

V. TRAINING OBJECTIVES (Cont'd):

B. Enabling Objectives (Cont'd):

5. Describe the operation of the CS system as it relates to the following:
   a. Precautions and limitations
   b. Major steps performed while placing the CS system in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect CS system operation
   f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the CS system as explained in this lesson:
   a. State Tech Specs/TRM LCOs that govern the CS system
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the CS system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events:

   Event Title: Containment Spray Pump Motor Breaker Inadvertently Left Opened Following Refueling Outage

VI. TRAINING AIDS:

A. Computer.
B. Computer Display Projector & Controls.
C. Local Area Network (LAN) Access.
D. Simulator (if available)

28. 003 A1.04 028
Given the following:

- Unit 1 is at 100% power.
- Annunciator Panel 1-XA-55-5B, Window B-5: "LS-68-34A/B REAC COOL PMP 2 OIL RESERVOIR LEVEL HI-LOW" alarms.
- RCP #2 motor bearing temperatures are within limits, stable, and being monitored.
- Reactor Building Pocket Sump level is 52%.

Which ONE of the following identifies two (2) actions required by the Annunciator Response Procedure?

A.✓ Pump pocket sump level down and monitor pocket sump level for significant change in rate of rise.
Request Electricians to determine if the oil level is high or low.

B. Pump pocket sump level down and monitor pocket sump level for significant change in rate of rise.
Place RCP Lift Oil Pump in service until oil levels can be verified.

C. Lockout the pocket sump pumps to prevent pumping oil until status of RCP motor bearing oil levels can be determined.
Request Electricians to determine if the oil level is high or low.

D. Lockout the pocket sump pumps to prevent pumping oil until status of RCP motor bearing oil levels can be determined.
Place RCP Lift Oil Pump in service until oil levels can be verified.

DISTRACTOR ANALYSIS:

A. *CORRECT, The ARI window B-5 directs the pocket sump to be pumped down to less than 45%, then the level monitored for significant change in the rate of rise and for the operators to request the electricians to determine if alarm is high or low using 1-PI-EMM-068-001.0.*

B. *Incorrect, the ARI directs pumping down and monitoring rate of change in the pocket sump but does not direct the starting of the RCP lift oil pump. Plausible because the actions associated with the pocket sump are correct and the lift oil pump running does supply oil to the RCP upper motor and thrust bearing.*

C. *Incorrect, the ARI directs the pocket sump be pumped and rate of rise monitored. This would require using the pocket sump pumps, not locking them out. Plausible because other sump pumps are locked out to prevent pumping oil when oil makes its way into the sumps and the request for the electricians to determine if alarm is high or low is correct.*

D. *Incorrect, the ARI directs the pocket sump be pumped and rate of rise monitored. This would require using the pocket sump pumps, not locking them out and does not direct the starting of the RCP lift oil pump. Plausible because other sump pumps are locked out to prevent pumping oil when oil makes its way into the sumps and and the lift oil pump running does supply oil to the RCP upper motor and thrust bearing.*

Question No. 28

Tier 2 Group 1

K/A 003A1.04
Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RCPS controls including:
RCP oil reservoir levels

Importance Rating: 2.6 / 2.5

Technical Reference: 1-AR-M5-B, CVCS Seal Water and RCP, Rev 36

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.RCP B.5.c
Describe the operation of the RCP system as it relates to the following:
c. Alarms and alarm response

Question Source:
Bank # __________
Modified Bank # __________
New _X_____

Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge __X___
Comprehension or Analysis ______

10 CFR Part 55 Content: (41.5 / 45.5)

10CFR55.43.b (n/a)

Comments: New question for 1/2009 NRC exam

Source	Setpoint	
SER 387		**LS-68-34A/B REAC COOL PMP 2 OIL RESERVOIR LEVEL HI-LOW**
Hi: LS-68-33A, LS-68-34A	Hi 1.25" above sightglass centerline	
Low: LS-68-33B, LS-68-34B	Low 1.00" below sightglass centerline	

Probable Causes

1. A high or low level in either the upper or lower bearing oil reservoir.

Corrective Actions

[1] **IF** reactor building pocket sump level is ≥ 45%, **THEN**
PUMP DOWN sump immediately to < 45%.

[2] **MONITOR** reactor building pocket sump for significant change in rate of rise (U0969, U0967, U0968). **[C.1]**

NOTE RCP #2 bearing temperatures are found on ICS Primary Mimics OR using ICS points 1T0433A, 1T0434A, 1T0435A, and 1T0436A.

[3] **MONITOR** RCP #2 motor bearing temperatures.

[4] **IF** Bearing Temperature exceeds 200°F
OR
Alarm is coincident with:

a. Upper or lower radial bearing temperature rise.
b. Excessive Reactor Coolant Pump Vibration.
c. Any other RCP parameter being abnormal, **THEN**

GO TO AOP-R.04, *Reactor Coolant Pump Malfunctions.*

[5] **REQUEST** electricians to determine if alarm is high or low. (1-PI-EMM-068-001.0)

[6] **IF** RCP oil level has been determined to be low, **THEN**
MONITOR RCP bearing temperatures closely, **AND**
HAVE oil added and pump inspected when containment entry is authorized.

[7] **IF** RCP oil reservoir level is determined to be high, **THEN**
NOTIFY Engineering to evaluate condition.

References 45N1616-6, 45B655-05B-0, 47B601-68-6, 47W610-68-1

APPENDIX B
Page 1 of 2

RCP MOTOR - BEARING OIL - LEVEL SWITCH ANNUNCIATION IDENTIFICATION (Continued)

NOTE The resistance values provided below are nominal not exact values.

RCP MOTOR #	CABLE ID TERM POINTS in 1-M-21	BEARING	ALARM	NOMINAL RESISTANCE (Ω)
1	1A3040 0380A/0380B	Upper	HI	23.1
			LO	16.2
		Lower	HI	11.1
			LO	6.4
2	1A3069 0387A/0387B	Upper	HI	22.4
			LO	16.7
		Lower	HI	11.6
			LO	6.6
3	1A3100 0394A/0394B	Upper	HI	19.3
			LO	14.5
		Lower	HI	9.5
			LO	4.6
4	1A3135 0401A/0401B	Upper	HI	20.7
			LO	15.2
		Lower	HI	10.4
			LO	5.5

[1] **MAINTAIN** configuration control per SPP-10.1, **AND**

ATTACH configuration control log sheets.

_______________/_______

NOTE Annunciator windows will "seal-in" on initial receipt of a field alarm condition, even if the field condition is intermittent, which is often the case with RCP motor oil level alarms.

[2] **DETERMINATE** field cable associated with alarm condition specified in step 3.3 **[6]**.

DOCUMENT wire lifts on MMDP-1.

ATTACH MMDP-1 log sheets. _______________/_______

APPENDIX B
page 2 of 2

RCP MOTOR - BEARING OIL - LEVEL SWITCH ANNUNCIATION IDENTIFICATION (Continued)

[3] **READ** resistance of cable through closed field alarm contacts **AND**

RECORD resistance: ________________Ω

______________________/__________

[4] **USE** Table above, **AND**

IDENTIFY alarm condition, **AND**

RECORD results in step 6.1 **[3]**.

[5] **RETERMINATE** field cable per MMDP-1.

____________________/__________ ____________________/__________
Independent Verifier Date

V. TRAINING OBJECTIVES (Cont'd):

B. Enabling Objectives (Cont'd):

5. Describe the operation of the RCP system as it relates to the following:
    a. Precautions and limitations
    b. Major steps performed while placing the RCP system in service
    c. Alarms and alarm response
    d. How a component failure will affect system operation
    e. How a support system failure will affect RCP system operation
    f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the RCP system as explained in this lesson:
    a. State Tech Specs/TRM LCOs that govern the RCPs
    b. State the ≤1 hour action limit TS LCOs
    c. Given the conditions/status of the RCP system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events:
    a. SQ961761PER; RCP#4 above 15mil vibration alarm
    b. SOER-82-5; Reactor Coolant Pump seal failure
    c. SER 20-86; RCP shaft failure at Crystal River

VI. TRAINING AIDS:

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)

29. 003 K4.02 029

Given the following:

- Unit 1 is in Mode 5 with water solid operation.
- RHR Train "A" is operating in shutdown cooling mode.
- RCS is at 160°F.
- VCT temperature is 115°F.
- #2 RCP as the only RCP running was inadvertently stopped 10 minutes ago after a 1 hour run.

Which ONE of the following identifies the requirements that must be met prior to attempting a restart of the #2 RCP?

A. Must wait 30 minutes from the time the pump was stopped, but the pump can be restarted with the RCS in water solid operation.

B. Must wait 30 minutes from the time the pump was stopped and a steam bubble must be established in the Pressurizer.

C. No time restriction on restarting the pump and it can be started with RCS in water solid operation.

D✓ No time restriction on restarting the pump, but a steam bubble must be established in the Pressurizer.

DISTRACTOR ANALYSIS:

The provisions to prevent cold water transients is incorporated into administrative restrictions (administrative interlocks) identified in the Precautions and Limitations in the General Operating Instructions and System Operating instructions alond with other requirements on the starting of a RCP.

A. Incorrect, There is no time restriction on restarting the pump and a steam bubble is needed in the pressurizer. Plausible because the 30 minutes could be applied since the time of the pump stop instead of the time of the start and an RCP can be started in solid water operation with different conditions

B. Incorrect, 1-SO-68-2 Precaution F and 0-GO- 1 Precaution J.10 identify that when the RCS temperature is greater than charging and seal injection temperature and the RCPs have been idle for > 5 minutes, a steam bubble is needed in the pressurizer prior to starting an RCP to minimize the pressure transient when the cold water injected by the charging pump is circulated in the RCS. Plausible because the 30 minutes could be applied since the time of the pump stop instead of the time of the start and the need for a steam bubble is correct.

C. Incorrect, No minute wait is required to restart the pump, however a steam bubble is needed in the pressurizer in accordance with the precautions in 1-SO-68-2 and 0-GO-1. Plausible because there is no required time wait prior to starting the pump and an RCP can be started in solid water operation with different conditions.

D. CORRECT, 1-SO-68-2 Precaution F and 0-GO- 1 Precaution J.10 identify that when the RCS temperature is greater than charging and seal injection temperature and the RCPs have been idle for > 5 minutes, a steam bubble is needed in the pressurizer prior to starting an RCP to minimize the pressure transient when the cold water injected by the charging pump is circulated in the RCS. 1-SO-68-2 Precaution D identifies that thirty minutes must be allowed between RCP starts. The pump has been in service for an hour, therefore, the 30 minute time between starts is met.

Question No. 29

Tier 2 Group 1

K/A 003 K4.02
Knowledge of RCPS design feature(s) and/or interlock(s) which provide for the following: Prevention of cold water accidents or transients

Importance Rating: 2.5 / 2.7*

Technical Reference: 1-SO-68-2, Reactor Coolant Pumps, Rev 30
0-GO-1, Unit startup from Cold Shutdown to Hot Standby, Rev 0048

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.RCP B.5.a
Describe the operation of the RCP system as it relates to the following:
a. Precautions and limitations

Question Source:
Bank # __________
Modified Bank # __________
New _X_____

Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge _______
Comprehension or Analysis _X_____

10 CFR Part 55 Content: (41.7)

10CFR55.43.b (n/a)

Comments: New question for 1/2009 NRC exam

3.0 PRECAUTIONS AND LIMITATIONS

A. Failure to observe all posted radiation control requirements may lead to unnecessary radiation absorbed doses.

B. Seal injection flow to RCP's must be maintained when RCS loops are being filled and anytime thereafter.

C. RCS must be filled and vented in accordance with 0-GO-13 prior to running RCP's continuously.

D. Limit number of attempted RCP starts to three within any two hour period. A one hour cooldown period will be observed before a fourth attempt is made. Thirty minutes must be allowed between RCP starts.

E. Operation of Reactor Coolant Pumps for greater than 2 minutes without CCS cooling to oil coolers will result in bearing temperatures greater than 200°F.

F. When RCS temperature is greater than charging and seal injection water temperature and RCPs have been idle > 5 minutes, a steam bubble is needed in the pressurizer prior to starting an RCP. This precaution will minimize the pressure transient when the cold water injected by the charging pump is circulated in the RCS.

G. When RCS is being cooled down by RHR, a non-uniform temperature distribution may occur with no RCP's running.

H. A steam bubble is needed in the pressurizer prior to starting an RCP to accommodate pressure surges.

I. Do not start the first RCP in mode 5 with the Steam Generator secondary side temperature above 200°F. This is to prevent a possible inadvertent mode change and to prevent the possibility of exceeding RCS heat up limitations. **[C.6]**

J. When in Mode 4, a reactor coolant pump shall not be restarted unless a steam bubble exists in the Pressurizer..

K. The following restrictions for RCP operation apply, when RHR is connected to the RCS for shutdown cooling, to prevent RHR over pressurization: (FCV-74-1 and 2 open)

- At least one RCP should remain in operation whenever RCS is greater than or equal to 160°F.
- When RCS temperature is greater than 200°F and less than 300°F, and no RCPs are running, a RCP can not be started unless pressurizer level is less than 65%.
- When RCS temperature is greater than 300°F AND no RCPs are running, a RCP can ***not*** be started regardless of pressurizer level.
- 1st RCP start up must be limited to less than 200 degrees with steam bubble in pressurizer with actual level less than 85%

3.0 PRECAUTIONS AND LIMITATIONS

L. The Source Range Monitor instrumentation must be monitored during startup of the first RCP. This precaution is necessary in order to detect rapid boron dilution from unborated water that could be flushed into the core.

M. If all RCP's are shutdown, do not start the first RCP if it is known that any volume of dilute water has been introduced into any reactor coolant loop until an action plan for recovery is developed as described in Appendix F Prevention of Rapid Boron Dilution. **[C.5]**

N. RCS pressure may increase when starting the first RCP.

Date__________

5.2 No. 2 Reactor Coolant Pump Start

CAUTION 1 **RHR over pressurization restrictions prohibit starting a RCP, when RCS temperature is greater than or equal to 300°F, AND no RCP's are running, AND RHR is aligned to the RCS for shutdown cooling.**

CAUTION 2 **RCS pressure may increase when starting the first RCP.**

CAUTION 3 **Computer point 1P0499A, which inputs to 0-SI-SXX-068-127.0, should be monitored along with compliance instrumentation to ensure all pressure /temperature requirements are met.**

NOTE If starting RCP for troubleshooting of vibration problems, after maintenance activities that affect pump vibration or for balance shot activities then refer to Appendix E for vibration monitoring requirements.

[1] **IF** *no* RCP's are running **and** [FCV-74-1] **and** [FCV-74-2] are OPEN, **THEN**

[a] **RECORD** RCS temperature. ___________°F ☐

[b] **IF** RCS temperature is >200°F and <300°F, **THEN** **ENSURE** pressurizer level is <60%. ___________

[2] **WHEN** greater than or equal to 30 minutes has elapsed since last No. 2 RCP run/attempted start, **THEN**

PROCEED to step 3. ___________

[3] **IF** access into containment is permitted **THEN**

PERFORM Appendix A RCP Local Inspection Check Sheet. ☐

[4] **VERIFY** [1-TR-70-161] CCS Hx 1A1/1A2 Outlet temperature less than or equal to 105°F. ___________

[5] **ENSURE** [1-HS-67-102] RCP Motor Cooler 1B is in the **P-AUTO** position. ___________

Date__________

5.2 No. 2 Reactor Coolant Pump Start (Continued)

[6] **IF** RCS pressure is greater than 100 psi**g**, **THEN**

ENSURE **[1-FCV-62-22]** RCP No. 2 Seal Leak-off and **[1-FCV-62-63]**, Seal Return Isolation are **OPEN**. __________

NOTE Appendix B should be used to diagnose RCP seal abnormalities.

[7] **DETERMINE** No. 2 RCP seal No. 1 leakoff ≥ 0.2 gp**m** by using any of the following:

INSTRUMENT	√
1–FR–62–23 (green pen scale range 0.0-1.0)	☐
1–FR–62–24 (green pen scale range 0.0-10.0)	☐
ICS	☐
Ultrasonic (requires a WR to be installed)	☐
Differential Pressure (requires a WR to be installed)	☐

N/A if leakoff is < 0.2 gpm. ☐

NOTE The Bucket Test is NO longer performed. Less than 0.2 gpm flow rate is acceptable for a short period of time after RCP seal maintenance has been performed, provided flow verification has been performed by ultrasonics or differential pressure.

[8] **IF** No. 2 RCP seal No. 1 leakoff is < 0.2 gp**m** and RCP seal maintenance has been performed (N/A if previously performed or by SRO discretion), **THEN**

[a] **INITIATE** a WR to have either an ultrasonic or differential pressure instrument installed). ☐

[b] **VERIFY** No. 2 RCP seal No. 1 leakoff flow rate from the installed ultrasonic or differential pressure instrument. ☐

[c] **EVALUATE** leak-off rate, continuation of RCP start-up, and duration of RCP run time. __________ SRO

Date__________

5.2 **No. 2 Reactor Coolant Pump Start** (Continued)

[9] **VERIFY** [1-PDI-62-21A] No. 2 RCP Seal No. 1 differential pressure ≥ 220 psid. __________

[10] **IF** Reactor Coolant Pump is being started after major maintenance, troubleshooting or for balance shot activities, **THEN**

PERFORM Appendix E for modified RCP vibration monitoring requirements and limitations. __________

[11] **PLACE** [1-HS-68-85A] No. 2 RCP Lift Oil Pump in the **START** position. ☐

[12] **WHEN** Lift Oil Pump for No. 2 RCP has run for ≥ 2 minutes, **THEN**

ANNOUNCE No. 2 RCP start on the P/A system. ☐

[13] **IF** no RCPs are running **AND** RCP No. 2 is the first RCP to be started, **THEN**

MONITOR the SRMs during startup of the RCP. **[C.3]** ☐

[14] **PLACE** [1-HS-68-31A] No. 2 RCP in the **START** position. ☐

NOTE Motor and Pump Operating parameters are listed in Appendix D. Appendix E provides vibration limits if pump is started for maintenance activities.

[15] **ENSURE** No. 2 RCP motor and pump are operating within the parameters listed in Appendix D. __________

Date__________

5.2 **No. 2 Reactor Coolant Pump Start** (Continued)

[16] **ENSURE** [1-TCV-67-102] RCP Motor Cooler 1B is **OPEN** (1-HS-67-102 red light illuminated). __________

[17] **WHEN** Lift Oil Pump has run ≥ one minute after RCP start, **THEN**

PLACE [1-HS-68-85A] No. 2 RCP Lift Oil Pump in the **STOP** Position. ☐

[18] **IF** RHR is removed from service, **THEN**

DETERMINE if both CCS pumps are needed in service. __________

[19] **IF** the second running pump is to be removed from service, **THEN**

GO TO 1–SO–70–1 and **STOP** the second running CCS pump. __________

END OF TEXT

3.1 PRECAUTIONS (continued)

c. If normal sprays are not available, the auxiliary spray should be used to maintain pressurizer outflow. At least one RCP should be in service to maintain RCS thermal equilibrium.

9. While water solid, if both trains of LTOPS are operable, then letdown orifice isolation valves may be closed.

10. If all RCPs have been stopped for more than five minutes AND the RCS temperature is greater than the charging and seal injection water temperature, a RCP can not be started until a steam bubble has been formed in the pressurizer. This will minimize a pressure transient when the first RCP is started due to the expansion of the previously injected cold water. If the RCS temperature is > 200°F but <300°F, and FCV-74-1 and 2 are open do not attempt to restart a RCP unless the pressurizer level is <60% (indicated) to prevent RHR overpressurization.

11. When water solid and RCS pressure is being maintained by the CVCS letdown pressure control valve, changes to the flow rate through the RHR loop by throttling of valves or starting and stopping the RHR pumps will result in changes to the RCS pressure. For example, stopping of the RHR pumps may cause an increase in the RCS pressure of between 100 and 150 psig.

12. If all RCPs are stopped and the reactor coolant is being cooled down by the RHR heat exchangers, a non-uniform temperature distribution may occur in the reactor coolant system. If the RCS temperature is >200°F but <300°F, and FCV-74-1 and 2 are open do not attempt to restart a RCP unless the pressurizer level is <60% (indicated) to prevent RHR overpressurization.

K. The RTD above the pressurizer surge line will detect liquid in-surges and out-surges, which shows up as an indication of a rapid temperature change. Due to pressurizer surge line stratification events, heatup and cooldown rates should be monitored during all evolutions. **[C.12]**

L. Industry experience with stuck open pressurizer spray valves indicates that stopping additional RCPs may be necessary to stop the RCS pressure decrease. The RCP in the affected loop and the loop 2 RCP (Prz Surge Line) must be stopped. Depending on pressurizer level, a third RCP may have to be stopped. (re: PER 02-003138-000 & INPO SEN 02-230)

M. Hydraulic locking of PORV's can cause slower stroke times. Several valve strokes may be required to clear the water from the valve bonnet following solid water operations. (re: PER 02-005477-000)

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** REACTOR COOLANT PUMP SYSTEM

IV. **LENGTH OF LESSON:** 4 hour lecture; 2 hour simulator demonstration; 2 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Reactor Coolant Pump system in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with the Reactor Coolant Pump System that are rated $\geq$ 2.5 during Initial License training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the Reactor Coolant Pump System as described in the SQN FSAR.
2. State the design basis of the Reactor Coolant Pump System in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the Reactor Coolant Pump System as illustrated on the simplified system drawing.
4. Describe the following items for each major component in the Reactor Coolant Pump System as described in this lesson:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the Reactor Coolant Pump System components are designed
   m. Location of controls and indications associated with the Reactor Coolant Pump System in the control room and auxiliary control room

30. 004 A3.11 030

Given the following:

- Operators are responding to a small break LOCA on Unit 1 in accordance with E-1, "Loss Of Reactor or Secondary Coolant".
- The Non-Essential Control Air header inside containment was depressurized and isolated due to a pipe rupture.

Which ONE of the following identifies how the CVCS charging and letdown isolation valves automatically respond to the given plant conditions?

	1-FCV-62-90 **Charging FCV Isolation**	**1-FCV-62-69** **Letdown Isolation**
A.	OPEN	OPEN
B.	OPEN	CLOSED
C.	CLOSED	OPEN
D✓	CLOSED	CLOSED

DISTRACTOR ANALYSIS:

A. *Incorrect, FCV-62-90 and FCV-62-69 close due to the combination of Safety Injection and loss of non-essential control air to containment. Plausible because other CVCS FCV's (62-85 and 62-86) fail open on a loss of air to containment.*

B. *Incorrect, FCV-62-90 and FCV 62-69 close due to the combination of Safety Injection and the loss of non-essential control air to containment. Plausible because other CVCS FCV's (62-85 and 62-86) fail open on a loss of air to containment and the correct position is listed for FCV-62-69.*

C. *Incorrect, FCV-62-90 and FCV 62-69 close due to the combination of Safety Injection and loss of non-essential control air to containment. Plausible because the status of 1-FCV-62-90 is correct and other CVCS FCV's (62-85 and 62-86) fail open on a loss of air to containment.*

D. *CORRECT, Plant conditions indictate that a Safety Injection (entry into E-1) and loss of non-essential control air (header depressurized) occurred that would cause FCV-62-90, Charging FCV Isolation to close on the SI and FCV-62-69, Letdown Isolation to close on a loss of control air to the valve operator.*

Question No. 30

Tier 2 Group 1

K/A 004 A3.11
Ability to monitor automatic operation of the CVCS, including: Charging/letdown

Importance Rating: 3.6 / 3.4

Technical Reference: 1-47W611-62-1, Rev. 4; 1-47W611-62-4, Rev. 15; AOP-M.02, Rev. 13

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.CVCS Obj. 4.g & 4.j
Describe the characteristics of each major component in the CVCS system:
g. interlocks (including setpoints)
j. Failure modes

Question Source:
Bank # __________
Modified Bank # ____X_____
New _______

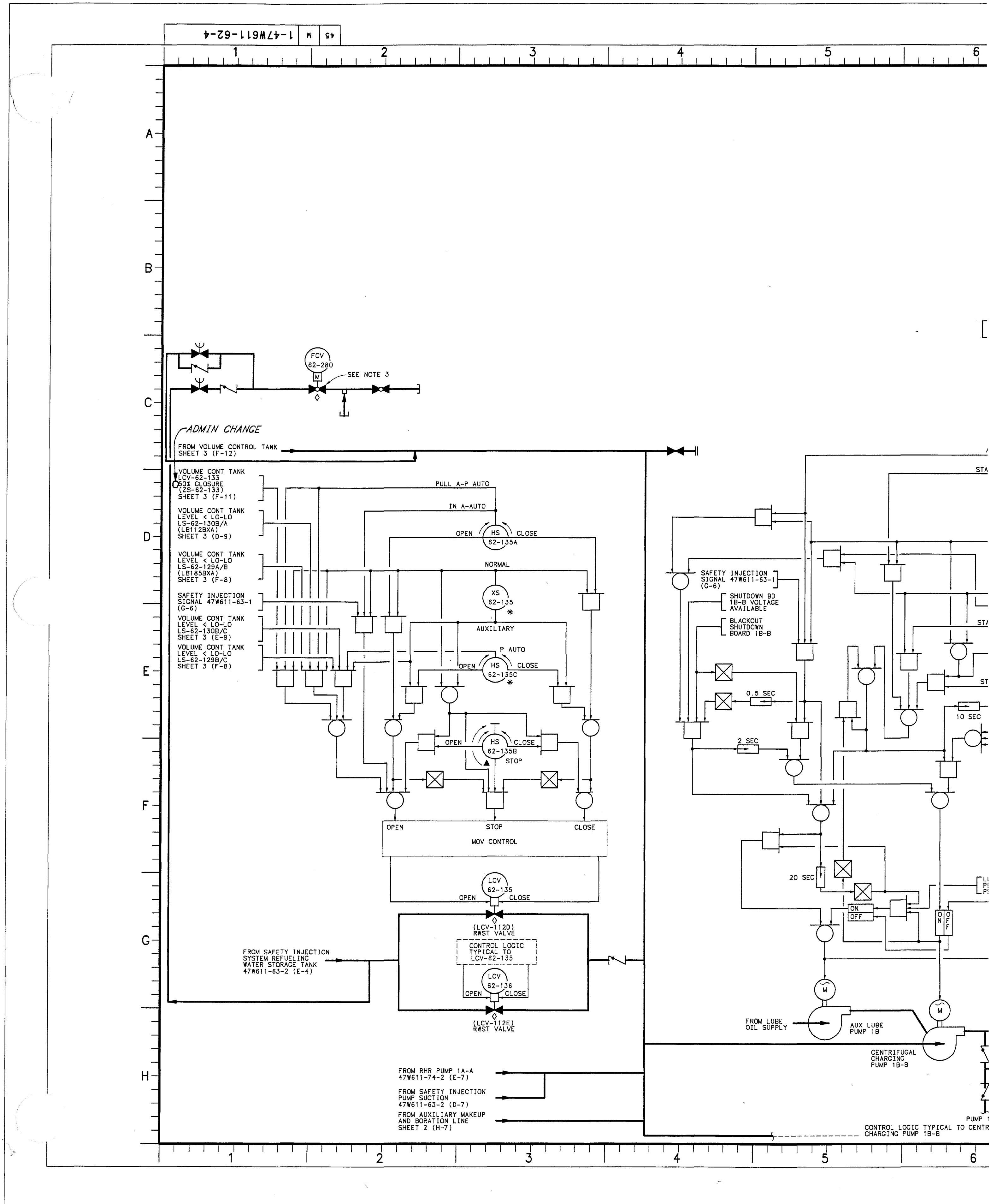
Question History: Watts Bar Exam Bank Question # SYS062A.05 018

Question Cognitive Level:
Memory or fundamental knowledge _______
Comprehension or Analysis __X____

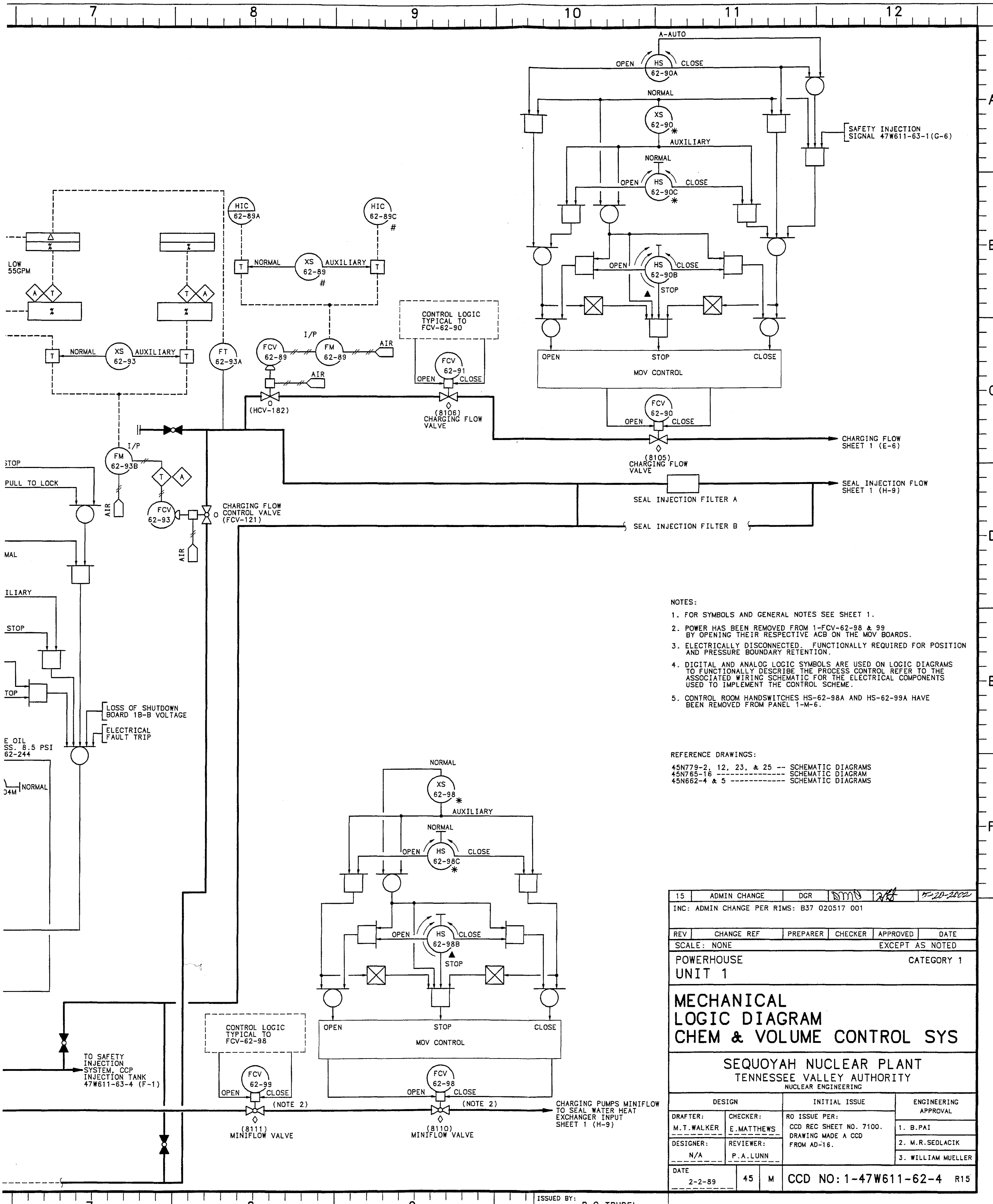
10 CFR Part 55 Content: (41.7 / 45.5)

10CFR55.43.b (n/a)

Comments: Modified question stem conditions and affected valves from original question.



1-47W611-62-4
M
45
FCV 62-280
M
SEE NOTE 3
ADMIN CHANGE
FROM VOLUME CONTROL TANK SHEET 3 (F-12)
VOLUME CONT TANK LCV-62-133 50% CLOSURE (ZS-62-133) SHEET 3 (F-11)
VOLUME CONT TANK LEVEL < LO-LO LS-62-130B/A (LB112BXA) SHEET 3 (D-9)
VOLUME CONT TANK LEVEL < LO-LO LS-62-129A/B (LB185BXA) SHEET 3 (F-8)
SAFETY INJECTION SIGNAL 47W611-63-1 (G-6)
VOLUME CONT TANK LEVEL < LO-LO LS-62-130B/C SHEET 3 (E-9)
VOLUME CONT TANK LEVEL < LO-LO LS-62-129B/C SHEET 3 (F-8)
PULL A-P AUTO
IN A-AUTO
OPEN
HS 62-135A
CLOSE
NORMAL
XS 62-135
AUXILIARY
P AUTO
OPEN
HS 62-135C
CLOSE
OPEN
HS 62-135B
CLOSE
STOP
OPEN
STOP
CLOSE
MOV CONTROL
LCV 62-135
OPEN
CLOSE
(LCV-112D) RWST VALVE
CONTROL LOGIC TYPICAL TO LCV-62-135
LCV 62-136
OPEN
CLOSE
(LCV-112E) RWST VALVE
FROM SAFETY INJECTION SYSTEM REFUELING WATER STORAGE TANK 47W611-63-2 (E-4)
FROM RHR PUMP 1A-A 47W611-74-2 (E-7)
FROM SAFETY INJECTION PUMP SUCTION 47W611-63-2 (D-7)
FROM AUXILIARY MAKEUP AND BORATION LINE SHEET 2 (H-7)
SAFETY INJECTION SIGNAL 47W611-63-1 (G-6)
SHUTDOWN BD 1B-B VOLTAGE AVAILABLE
BLACKOUT SHUTDOWN BOARD 1B-B
0.5 SEC
2 SEC
10 SEC
20 SEC
ON
OFF
M
FROM LUBE OIL SUPPLY
AUX LUBE PUMP 1B
M
CENTRIFUGAL CHARGING PUMP 1B-B
CONTROL LOGIC TYPICAL TO CENTR
CHARGING PUMP 1B-B



NOTES:

1. FOR SYMBOLS AND GENERAL NOTES SEE SHEET 1.
2. POWER HAS BEEN REMOVED FROM 1-FCV-62-98 & 99 BY OPENING THEIR RESPECTIVE ACB ON THE MOV BOARDS.
3. ELECTRICALLY DISCONNECTED. FUNCTIONALLY REQUIRED FOR POSITION AND PRESSURE BOUNDARY RETENTION.
4. DIGITAL AND ANALOG LOGIC SYMBOLS ARE USED ON LOGIC DIAGRAMS TO FUNCTIONALLY DESCRIBE THE PROCESS CONTROL REFER TO THE ASSOCIATED WIRING SCHEMATIC FOR THE ELECTRICAL COMPONENTS USED TO IMPLEMENT THE CONTROL SCHEME.
5. CONTROL ROOM HANDSWITCHES HS-62-98A AND HS-62-99A HAVE BEEN REMOVED FROM PANEL 1-M-6.

REFERENCE DRAWINGS:

45N779-2, 12, 23, & 25 -- SCHEMATIC DIAGRAMS
45N765-16 --------------- SCHEMATIC DIAGRAM
45N662-4 & 5 ------------ SCHEMATIC DIAGRAMS

Pull

REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
15	ADMIN CHANGE	DGR	DMB	[illegible]	5-20-2002
INC: ADMIN CHANGE PER RIMS: B37 020517 001					

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE CATEGORY 1
UNIT 1

MECHANICAL LOGIC DIAGRAM CHEM & VOLUME CONTROL SYS

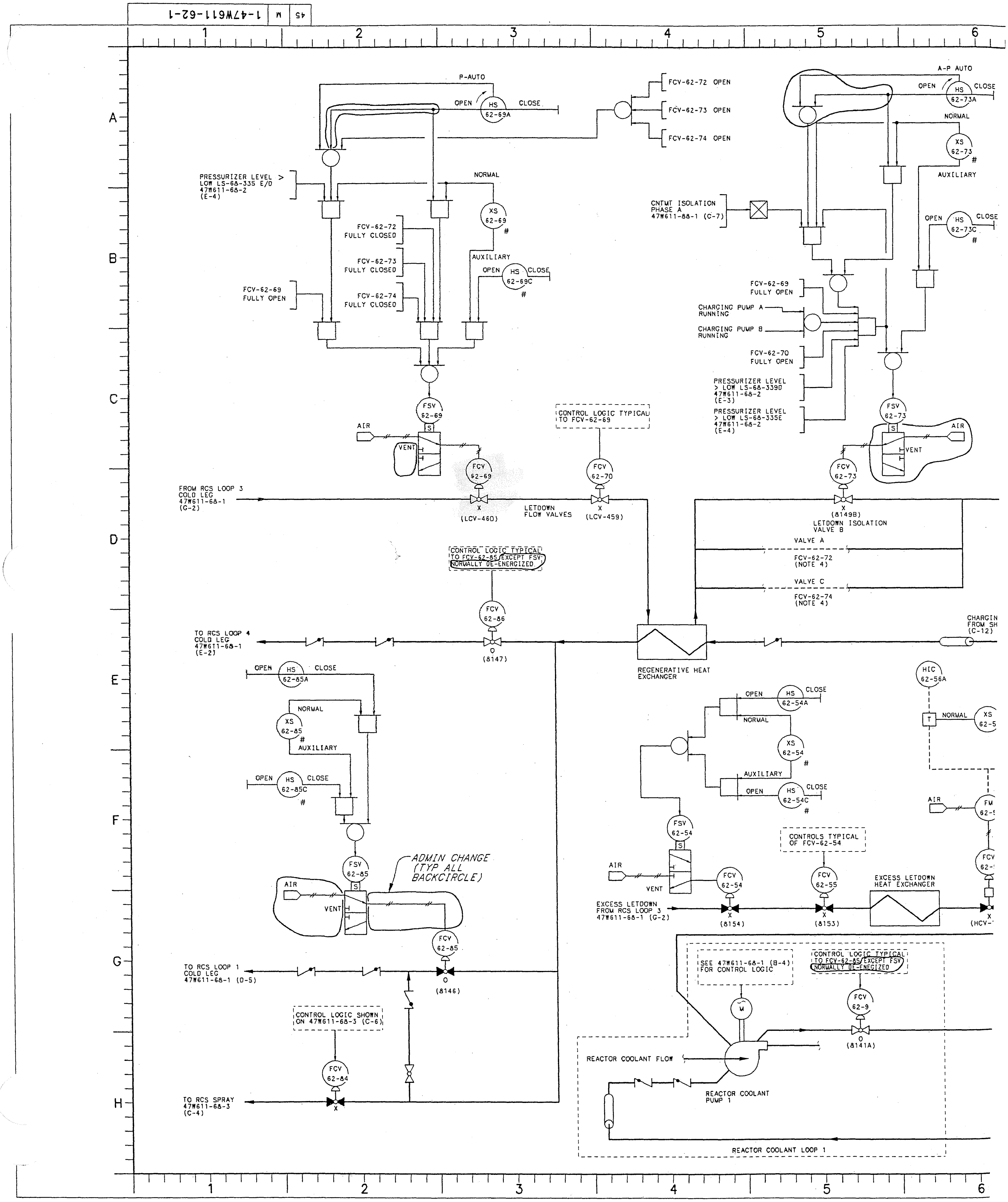
SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
NUCLEAR ENGINEERING

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: M.T.WALKER	CHECKER: E.MATTHEWS	RO ISSUE PER: CCD REC SHEET NO. 7100. DRAWING MADE A CCD FROM AD-16.	1. B.PAI
DESIGNER: N/A	REVIEWER: P.A.LUNN		2. M.R.SEDLACIK
			3. WILLIAM MUELLER
DATE 2-2-89	45 M	CCD NO: 1-47W611-62-4 R15	

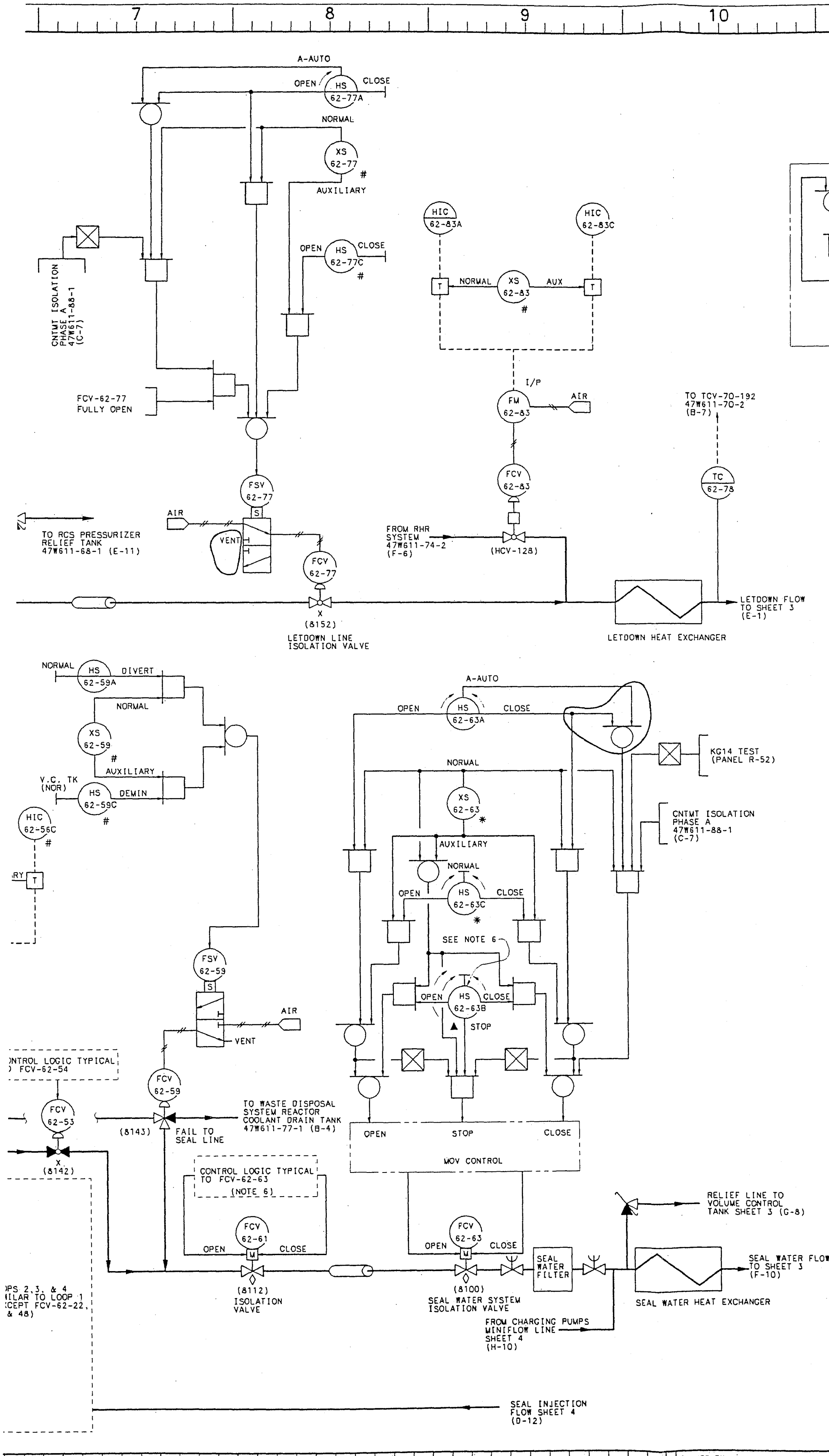
ISSUED BY: P.G.TRUDEL

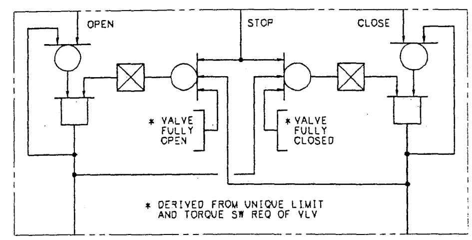
CAD MAINTAINED DRAWING

CONTROL ROOM DWG



1-47W611-62-1
M
45
P-AUTO
OPEN
HS 62-69A
CLOSE
FCV-62-72 OPEN
FCV-62-73 OPEN
FCV-62-74 OPEN
A-P AUTO
HS 62-73A
NORMAL
XS 62-73
AUXILIARY
PRESSURIZER LEVEL > LOW LS-68-335 E/D 47W611-68-2 (E-4)
NORMAL
XS 62-69
FCV-62-72 FULLY CLOSED
FCV-62-73 FULLY CLOSED
FCV-62-74 FULLY CLOSED
FCV-62-69 FULLY OPEN
AUXILIARY
HS 62-69C
CNTMT ISOLATION PHASE A 47W611-88-1 (C-7)
HS 62-73C
FCV-62-69 FULLY OPEN
CHARGING PUMP A RUNNING
CHARGING PUMP B RUNNING
FCV-62-70 FULLY OPEN
PRESSURIZER LEVEL > LOW LS-68-339D 47W611-68-2 (E-3)
PRESSURIZER LEVEL > LOW LS-68-335E 47W611-68-2 (E-4)
FSV 62-69
AIR
VENT
CONTROL LOGIC TYPICAL TO FCV-62-69
FCV 62-69
FCV 62-70
FSV 62-73
FCV 62-73
FROM RCS LOOP 3 COLD LEG 47W611-68-1 (G-2)
(LCV-460)
LETDOWN FLOW VALVES
(LCV-459)
(8149B)
LETDOWN ISOLATION VALVE B
VALVE A
FCV-62-72 (NOTE 4)
VALVE C
FCV-62-74 (NOTE 4)
CONTROL LOGIC TYPICAL TO FCV-62-85 EXCEPT FSV NORMALLY DE-ENERGIZED
FCV 62-86
(8147)
TO RCS LOOP 4 COLD LEG 47W611-68-1 (E-2)
REGENERATIVE HEAT EXCHANGER
CHARGIN FROM SH (C-12)
HS 62-85A
NORMAL
XS 62-85
AUXILIARY
HS 62-85C
HS 62-54A
NORMAL
XS 62-54
AUXILIARY
HS 62-54C
HIC 62-56A
FSV 62-85
ADMIN CHANGE (TYP ALL BACKCIRCLE)
FSV 62-54
CONTROLS TYPICAL OF FCV-62-54
FCV 62-54
FCV 62-55
EXCESS LETDOWN HEAT EXCHANGER
EXCESS LETDOWN FROM RCS LOOP 3 47W611-68-1 (G-2)
(8154)
(8153)
FCV 62-85
TO RCS LOOP 1 COLD LEG 47W611-68-1 (D-5)
(8146)
SEE 47W611-68-1 (B-4) FOR CONTROL LOGIC
CONTROL LOGIC TYPICAL TO FCV-62-85 EXCEPT FSV NORMALLY DE-ENERGIZED
FCV 62-9
(8141A)
CONTROL LOGIC SHOWN ON 47W611-68-3 (C-6)
FCV 62-84
TO RCS SPRAY 47W611-68-3 (C-4)
REACTOR COOLANT FLOW
REACTOR COOLANT PUMP 1
REACTOR COOLANT LOOP 1





TYPICAL MOV CONTROL

NOTES:

1. FOR SYMBOLS OTHER THAN THOSE NOTED BELOW SEE INSTRUMENTATION AND IDENTIFICATION STANDARDS, LATEST ISSUE.
2. FOR COMPLETE INSTRUMENTATION AND COMPONENT SEPARATION DESIGNATIONS SEE CONTROL DIAGRAM, 47W610-62-1 THRU 6.
3. NUMBERS IN PARENTHESIS ARE WESTINGHOUSE INSTRUMENT NUMBERS.
4. VALVES FCV-62-72 AND FCV-62-74 ARE NORMALLY CLOSED.
5. WDP DESIGNATES EQUIPMENT LOCATED ON WASTE DISPOSAL PANEL.
6. DISCONNECT HS-62-61B, THIS HANDSWITCH IS DISCONNECTED BECAUSE CIRCUIT INTEGRITY MAY BE COMPROMISED BY A POSSIBLE LOCA.
7. DIGITAL AND ANALOG LOGIC SYMBOLS ARE USED ON LOGIC DIAGRAMS TO FUNCTIONALLY DESCRIBE THE PROCESS CONTROL. REFER TO THE ASSOCIATED WIRING SCHEMATIC FOR THE ELECTRICAL COMPONENTS USED TO IMPLEMENT THE CONTROL SCHEME.

SYMBOLS:

- * ------- LOCATED ON ELECTRICAL SWITCHGEAR
- # ------- LOCATED IN AUXILIARY CONTROL ROOM.
- ▲ ------- TEST SWITCH
- Δ ------- LOCAL SWITCH

REFERENCE DRAWINGS:

- 47W611-0-1 & 2 ------ LOGIC DIAGRAMS, INDEX & SYMBOLS
- 47W610-62-1 THRU 6 -- CONTROL DIAGRAM
- 47W809 SERIES ------- FLOW DIAGRAM
- 45N779-29 ----------- SCHEMATIC DIAGRAM
- 45N662-1, 2 & 4 ----- SCHEMATIC DIAGRAMS
- 47W611-68-1 THRU 3 -- LOGIC DIAGRAMS
- 47W611-77-1 --------- LOGIC DIAGRAM
- 47W611-74-2 --------- LOGIC DIAGRAM
- 47W611-88-1 --------- LOGIC DIAGRAM

COMPANION DRAWINGS:

- 47W611-62-2 THRU 7 -- LOGIC DIAGRAM

REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
4	ADMIN CHANGE	MEB			
INC: ADMIN CHANGE PER 837 000810 001					

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE
UNIT 1 CATEGORY 1

MECHANICAL
LOGIC DIAGRAM
CHEMICAL & VOLUME CONT SYS

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
NUCLEAR ENGINEERING

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: M.A. COX	CHECKER: E. MATTHEWS	RO ISSUE PER: CCD REC SHEET NO. 7094. DRAWING MADE A CCD FROM AD-10.	1 B. PAI
DESIGNER: N/A	REVIEWER: P.A. LUNN		2 M.R. SEDLACIK
			3 M.A. AGUIRRE
DATE 2-2-89	45 M	CCD NO: 1-47W611-62-1	R4

ISSUED BY: P.G. TRUDEL

CAD MAINTAINED DRAWING

CONTROL ROOM DWG

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2.2 Loss of Nonessential Control Air in MODE 1, 2, or 3 (cont'd)

NOTES:

- Charging FCVs 1(2)-62-85, -86, -89, and -93 fail OPEN on loss of air.
- With normal and excess letdown FCVs failed CLOSED, pressurizer level will continue to rise. Reducing seal injection flow slows rate of level rise.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17.	**CHECK** normal letdown IN SERVICE.	**PERFORM** the following: a. **ENSURE** charging isolation valves CLOSED: • 1(2)-FCV-62-90 • 1(2)-FCV-62-91 b. **IF** CCP **NOT** running, **THEN** **START** CCP **USING** 1(2)-SO-62-1, Chemical and Volume Control System. c. **DISPATCH** operator to maintain RCP seal injection between 6 and 8 gpm per pump using Seal Water Inj Needle Valves: [Aux Bldg, 690' elev pipe chase, by CCPIT]: • 1(2)-62-556, RCP 1 • 1(2)-62-557, RCP 2 • 1(2)-62-558, RCP 4 • 1(2)-62-559, RCP 3

QUESTIONS REPORT

for Superwhaminine ILT EXAM BANK MARCH 2007

SYS062A.05 018

Given the following:

- Unit 1 was responding to a small-break LOCA in E-1 (Loss of Reactor or Secondary Coolant).
- Containment pressure = 0.7 psig (at peak pressure for the event)
- The Non-Essential Control Air header inside containment was depressurized and isolated due to pipe rupture.
- The Non-Essential Control Air system outside containment remained pressurized.

Which ONE of the following statements describes the positions of valves 1-FCV-62-74, Letdown Orifice Isolation, and 1-FCV-62-91, Charging Isolation?

	1-FCV-62-74	1-FCV-62-91
a.	open	open
b.	open	closed
c.	closed	open
d.✓	closed	closed

E-1 can only be entered if an SI occurred. SI will close 62-91

Notes:

K/A {CFR}: 004K1.14 [2.6/2.8] {41.3, 4, 5, 7}

References:

LP/Objectives: OPT200.CVCS, Obj 9.k
OPL273D0502, Obj 3

History: Unknown

Level: Comprehension

Est Time: 3 min.

Comments:

Reference:		K/A Number:	
K/A Value:		Last Used:	0506R WK 8
Level:		Source:	BANK
Tier/Grp:		SRO Only:	

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** CHEMICAL AND VOLUME CONTROL

IV. **LENGTH OF LESSON:** 4 hour lecture; 1 hour simulator demonstration; 1 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Chemical and Volume Control (CVCS) system in the plant and on the simulator.

B. Learning Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge and abilities associated with the CVCS system that are rated $\geq$ 2.5 during Initial License Training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the CVCS system as described in the FSAR.
2. State the design basis of the CVCS system in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the CVCS system as illustrated on a simplified system drawing.
4. Describe the following characteristics of each major component in the CVCS system:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the CVCS system components are designed
   m. Location of controls and indications associated with the CVCS system in the control room and auxiliary control room

V. TRAINING OBJECTIVES (Cont'd):

B. <u>Learning Objectives</u> (Cont'd):

5. Describe the operation of the CVCS system:
   a. Precautions and limitations
   b. Major steps performed while placing the CVCS system in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect CVCS system operation
   f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the CVCS system:
   a. State Tech Specs/TRM LCOs that govern the CVCS
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the CVCS system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events

VI. TRAINING AIDS:

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)

31. 005 K6.03 031

Plant conditions are as follows:

- Unit 1 is in Mode 4.
- RHR Train "A" is in service per 0-SO-74-1, "Residual Heat Removal System".
- RCS temperature is stable at the current RHR flow rate.

Which ONE of the following malfunctions will result in a REDUCTION in flow through the RHR Heat Exchanger 1A?

A loss of ...

A.✓ air to 1-FCV-74-32, RHR HTX Bypass.

B. air to 1-FCV-74-16, RHR HTX "A" Outlet.

C. 120V AC Vital Instrument Power Board 1-II.

D. 480V Shutdown Board 1A1-A.

<u>*DISTRACTOR ANALYSIS*</u>:

A. CORRECT. 1-FCV-74-32 fails open on loss of air, causing RHR flow to bypass the RHR HX, resulting in less flow through the RHR HX.

B. Incorrect. 1-FCV-74-16 fails open on loss of air, causing more flow through the RHR HX. Plausible if applicant reverses the failure position of valve(s) or misapplies the effect of the failure.

C. Incorrect. Loss of 120V AC 1-II will not have any effect on RHR flow through the RHR HX. Plausible because examinee may reverse the trains.

D. Incorrect. Loss of 480V shutdown board will not change flow rate through the A RH HX (MOVs fail as is). Plausible because 480V SD BD 1A1-A does provide power to train A RHR components.

Question No. 31

Tier 2 Group 1

K/A 005 K6.03
Residual Heat Removal: Knowledge of the effect of a loss or malfunction on the following will have on the RHRS: RHR heat exchanger.

Importance Rating: 2.5 / 2.6

Technical Reference: 1-47W611-74-2 R4
AOP-P.03, Loss of Unit 1 Vital Instrument Power Board, Rev 21

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.RHR B.4.j & 5.d
Describe the characteristics of each major component in the RHR system:
j. Failure modes
Describe the operation of the RHR :
d. How a component fialure will effect system operation.

Question Source:
Bank # __X_______
Modified Bank # __________
New _________

Question History: SQN bank question 005 K6.03 031

Question Cognitive Level:
Memory or fundamental knowledge ________
Comprehension or Analysis __X____

10 CFR Part 55 Content: (41.7 /45.7)

10CFR55.43.b (n/a)

Comments:

APPENDIX B

SIGNIFICANT IMPACTS FROM LOSS OF VIPB 1-II

1-M-5
• **Automatic operation of both pressurizer PORVs fails. Manual operation is available.** • **Charging flow controller 1-HIC-62-93 will not function in automatic. Charging header flow indicator 1-FI-62-93A fails low.** • **CCP suction swaps to RWST due to loss of separation relays.** • Pressurizer pressure instrument 1-PI-68-334 fails downscale. • Loop 3 and 4 hot leg and cold leg temperature indicators fail. • Loop 2 Tave indicator 1-TI-68-25E fails low. • RCP No. 2 seal parameters fail downscale (1-TI-62-16, 1-TI-62-17, 1-FI-62-14A, 1-PDI-62-21A).
1-M-6
• **Letdown isolates if 1-LT-68-335 is selected as the backup channel on 1-XS-68-339E.** • **VCT automatic makeup fails and letdown will not automatically divert due to loss of power to 1-LIC-62-129A.** • **RHR flow controller 1-HIC-74-28 is de-energized. 1-FCV-74-28 fails open.** Train B RHR temperature indications and Train A RHR heat exchanger outlet temperature are lost.
1-M-15
• **Train B air to containment (1-FCV-32-102) and auxiliary control air from Turbine building (0-FCV-32-85) fail closed.**
0-M-12
• The following radiation monitors are de-energized: 1-RE-90-112, 0-RM-90-103, 0-RE-90-126, and 1-RE-90-131.

A TRAIN IN SERVICE

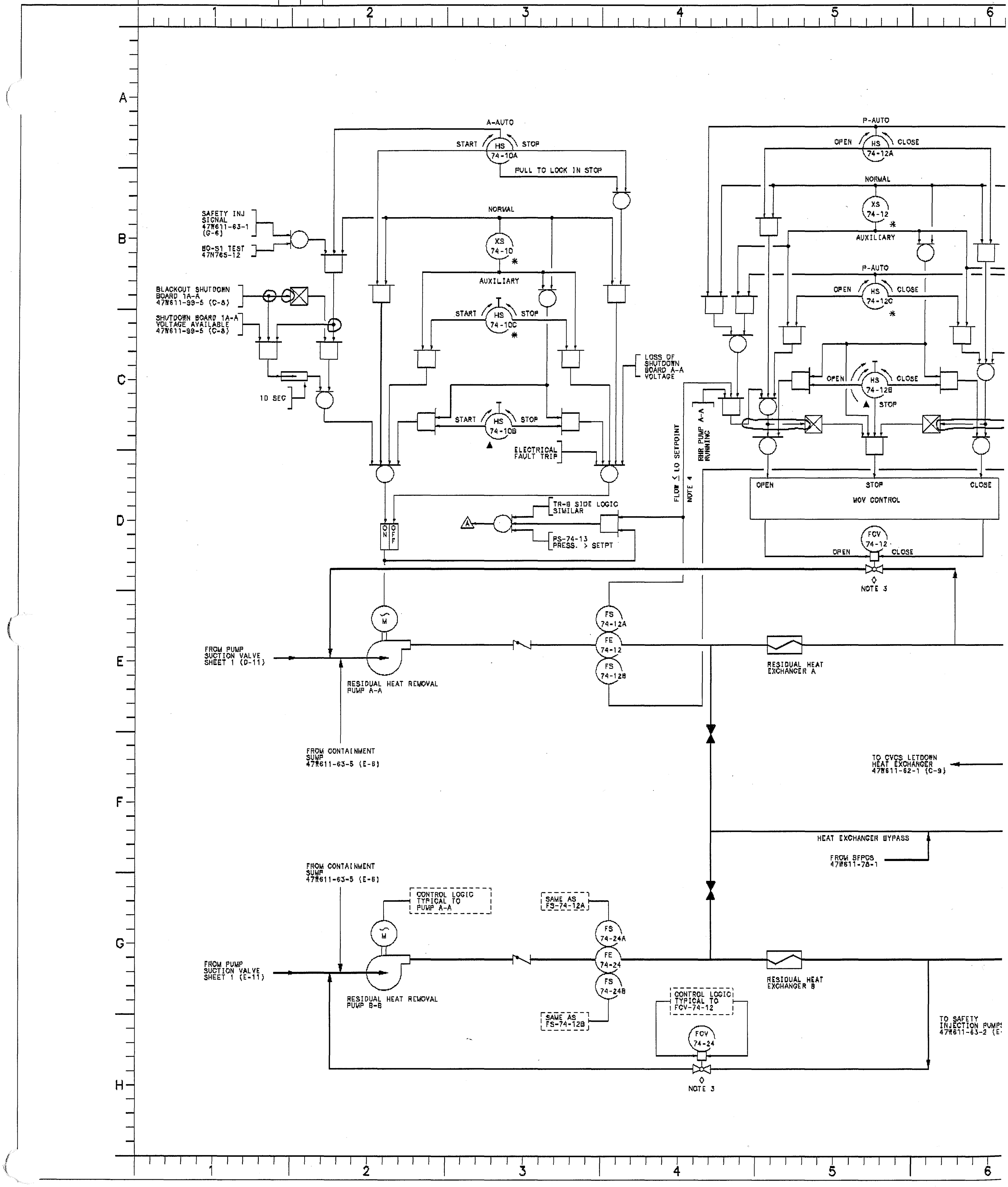
APPENDIX A

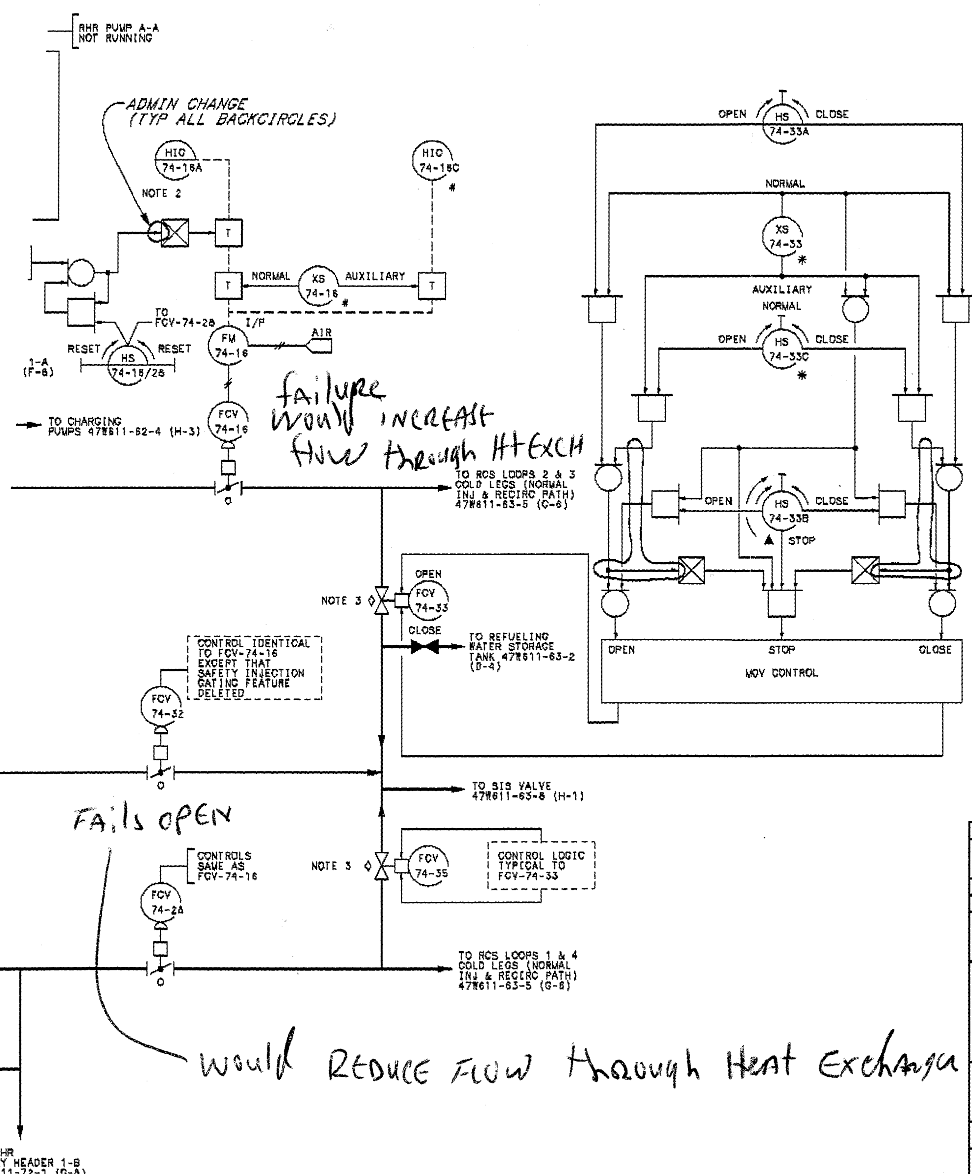
SIGNIFICANT IMPACTS FROM LOSS OF VIPB 1-I

1-M-5
• **Automatic operation of both pressurizer PORVs fails. Manual operation is available.** • **Charging and seal injection flow controllers 1-HIC-62-93 and 1-HIC-62-89 de-energized. Associated valves fail open.** • **CCP suction swaps to RWST due to loss of separation relays.** • Pressurizer pressure instrument 1-PI-68-340 fails downscale. • Loop 1 and 2 hot leg and cold leg temperature indicators fail. • Loop 1 Tave indicator 1-TI-68-2E fails low. • RCP No. 1 seal parameters indicate downscale. • **Excess letdown controller 1-HIC-62-56 is de-energized.**
1-M-6
• **Letdown will be isolated immediately if 1-LT-68-339 is selected as the controlling channel on 1-XS-68-339E OR if CCP 1B-B is in service. Letdown will also isolate due to loss of non-essential air to containment.** • **Letdown pressure controller 1-HIC-62-81 is de-energized. 1-PCV-62-81 fails open.** • **RHR controllers 1-HIC-74-16 and 1-HIC-74-32 fail open and 1-HIC-62-83 fails closed due to loss of power to plugmold.**
1-M-15
• **Train A air to containment (1-FCV-32-80), Non-Essential air to containment (1-FCV-32-110) and auxiliary control air from Turbine building (0-FCV-32-82) fail closed.**
0-M-12
• The following radiation monitors are de-energized: 1-RE-90-106, 0-RM-90-102, 0-RE-90-125, and 1-RE-90-130.

Distractor has loss of VIPB 1-II

1-47W611-74-2 M 45





NOTES:

1. FOR GENERAL NOTES SEE SHEET 1.
2. SELF REGULATING VALVE UTILIZES ANALOG SIGNAL TO MAINTAIN CONSTANT FLOW AT SET POINT ESTABLISHED IN CONTROL ROOM. SAFETY INJECTION SIGNAL REMOVES CONTROL SIGNAL AND ALLOWS VALVE TO GO FULLY OPEN.
3. SEE SHEET 1 FOR TYPICAL MOTOR OPERATED VALVE CONTROL.
4. SEE APPROPRIATE INSTRUMENT TABULATION FOR SETPOINT.
5. DIGITAL AND ANALOG LOGIC SYMBOLS ARE USED ON LOGIC DIAGRAMS TO FUNCTIONALLY DESCRIBE THE PROCESS CONTROL. REFER TO THE ASSOCIATED WIRING SCHEMATIC FOR THE ELECTRICAL COMPONENTS USED TO IMPLEMENT THE CONTROL SCHEME.

REFERENCE DRAWINGS:

45N779-9 & 43 --------- SCHEMATIC DIAGRAMS
45N674 ---------------- SCHEMATIC DIAGRAM
45N765-13 ------------- SCHEMATIC DIAGRAM
45W610-74-1 ----------- CONTROL DIAGRAM

Pull

REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
4	ADMIN CHANGE	DGR			
INC: ADMIN CHANGE PER RIMS: B37 000810 002					

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE CATEGORY 1
UNIT 1

MECHANICAL LOGIC DIAGRAM RESIDUAL HEAT REMOVAL SYS

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
NUCLEAR ENGINEERING

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: M.T.WALKER	CHECKER: E.MATTHEWS	RO ISSUE PER: CCD REC SHEET NO. 7137. DRAWING MADE A CCD FROM AD-14.	1 B.PAI
DESIGNER: N/A	REVIEWER: P.A.LUNN		2 M.R.SEDLACIK
			3 CULL A. WILLE
DATE 2-2-89	45 M	CCD NO: 1-47W611-74-2	R4

ISSUED BY: P.G.TRUDEL

CAD MAINTAINED DRAWING

CONTROL ROOM DWG

005 K6.03 031

Plant conditions are as follows:

- Unit 1 is in Mode 4
- RHR Train A is in service per 0-SO-74-1, Residual Heat Removal System
- RCS temperature is stable at the current RHR flow rate.

Which one of the following malfunctions will result in a **reduction** in flow through RHR Heat Exchanger 1A?

A.✓ Loss of air to 1-FCV-74-32, RHR HTX Bypass

B. Loss of air to 1-FCV-74-16, RHR HTX "A" Outlet

C. Loss of 120V AC Vital Instrument Power Board 1-II

D. Loss of 480V Shutdown Board 1A1-A

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** RESIDUAL HEAT REMOVAL SYSTEM

IV. **LENGTH OF LESSON:** 2 hour lecture; 1 hour simulator demonstration; 1 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the RHR in the plant and on the simulator.

B. Learning Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge and abilities associated with the RHR that are rated ≥2.5 during Initial License Training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the RHR as described in the FSAR.
2. State the design basis of the RHR in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the RHR as illustrated on a simplified system drawing.
4. Describe the following characteristics of each major component in the RHR:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the RHR components are designed
   m. Location of controls and indications associated with the RHR in the control room and auxiliary control room

V. TRAINING OBJECTIVES (Cont'd):

B. Learning Objectives (Cont'd):

5. Describe the operation of the RHR:
   a. Precautions and limitations
   b. Major steps performed while placing the RHR in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect the RHR operation
   f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the RHR as explained in this lesson:
   a. State Tech Specs/TRM LCOs that govern the RHR
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the RHR components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events
   a. OE5029, Loss of RHR at SQN
   b. OE5694, RHR Relief Lifted
   c. SER 19-93, Abnormal RHR HX operation results in CCS Water Hammer
   d. SOER 84-7, Pressure Locking and Thermal Binding of Gate Valves
   e. SOER 85-4, Losses or Degradation of RHR Capability
   f. SOER 88-3, Losses of RHR with Reduced Vessel Water Level

VI. TRAINING AIDS:

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)

32. 006 A3.06 032
Given the following:

- A Main Steam Line Break occurred on Unit 2.
- Reactor Trip and Safety Injection actuated automatically.
- No operator actions have been taken.

Which ONE of the following identifies the expected ECCS valve position for these conditions?

VALVE	**POSITION**
A. FCV-63-25, CCPIT Outlet Valve	Closed
B. LCV-62-133, VCT Outlet Valve	Open
C✓ FCV-62-98, CCP Miniflow Valve	Open
D. FCV-74-16, RHR Heat Exch. Outlet Valve	Closed

DISTRACTOR ANALYSIS:

A. *Incorrect, FCV-63-25 is a normally closed valve that opens on an SI signal. Plausible if the position of the valves is reversed.*

B. *Incorrect, LCV-62-133 is a normally open valve that closes on an SI signal. Plausible if the position of the valves is reversed.*

C. *CORRECT, FCV-62-98 is normally open and the valve is designed to recieve a signal to close on a safety injection but due to the power being removed at the breaker, the valve remains open.*

D. *Incorrect, FCV-74-16 opens on an SI signal. Plausible if the position of the valves is reversed.*

Question No. 32

Tier 2 Group 1

K/A 006 A3.06
Ability to monitor automatic operation of the ECCS, including: Valve lineups

Importance Rating: 3.9 / 4.2

Technical Reference: 2-47-W611-62-4; 62-3; and 63-4

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.ECCS B.4.e & .i
Describe the following items for each major component in the ECCS system:
e. Component Operation
i. Protective features

Question Source:
Bank # __________
Modified Bank # ____X______
New _______

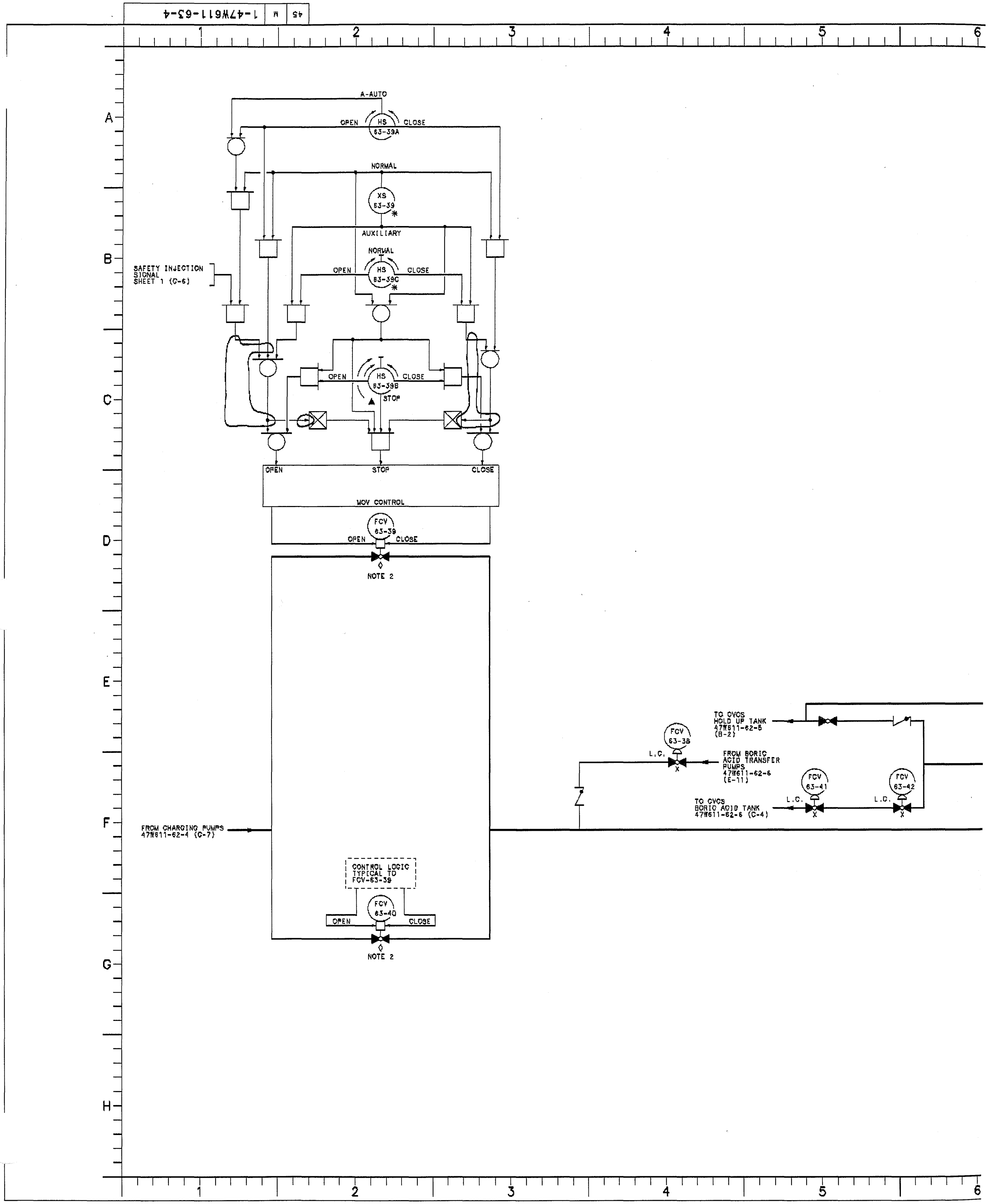
Question History: SQN Bank Question ECCS-B.17.C 001

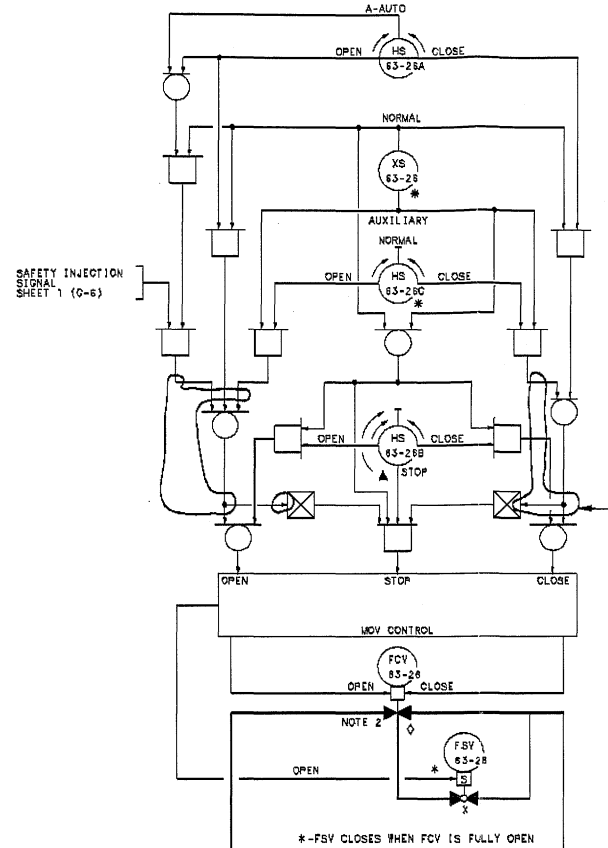
Question Cognitive Level:
Memory or fundamental knowledge ___X____
Comprehension or Analysis _______

10 CFR Part 55 Content: (41.7 / 45.5)

10CFR55.43.b (n/a)

Comments: Modified stem conditions and question format. Reworded stem to ask for correct valve position vs. misalignment and changed answer and distractors accordingly.


45 M 1-47W611-63-4
A-AUTO
OPEN HS 63-39A CLOSE
NORMAL
XS 63-39 *
AUXILIARY
NORMAL
OPEN HS 63-39C CLOSE *
SAFETY INJECTION SIGNAL SHEET 1 (C-6)
OPEN HS 63-39B CLOSE
STOP
OPEN
STOP
CLOSE
MOV CONTROL
FCV 63-39
OPEN
CLOSE
NOTE 2
FROM CHARGING PUMPS 47W611-62-4 (C-7)
CONTROL LOGIC TYPICAL TO FCV-63-39
FCV 63-40
OPEN
CLOSE
NOTE 2
TO CVCS HOLD UP TANK 47W611-62-5 (B-2)
FCV 63-38
L.C.
FROM BORIC ACID TRANSFER PUMPS 47W611-62-6 (E-11)
FCV 63-41
FCV 63-42
L.C.
L.C.
TO CVCS BORIC ACID TANK 47W611-62-6 (C-4)



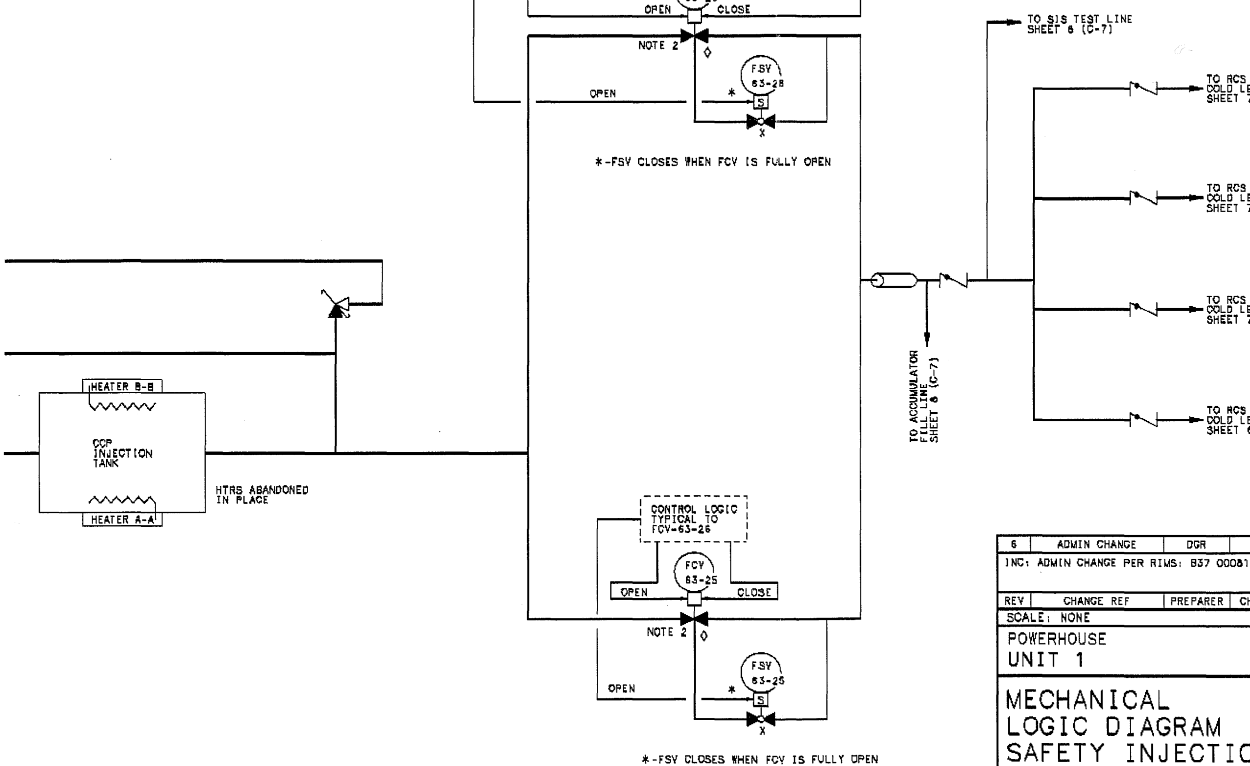
ADMIN CHANGE (TYP ALL BACKCIRCLES)

NOTES:

1. FOR SYMBOLS AND GENERAL NOTES SEE SHEET 1.
2. SEE SHEET 1 FOR MOV CONTROLS.
3. DIGITAL AND ANALOG LOGIC SYMBOLS ARE USED ON LOGIC DIAGRAMS TO FUNCTIONALLY DESCRIBE THE PROCESS CONTROL. REFER TO THE ASSOCIATED WIRING SCHEMATIC FOR THE ELECTRICAL COMPONENTS USED TO IMPLEMENT THE CONTROL SCHEME.

REFERENCE DRAWINGS:

45N663 ------------------ SCHEMATIC DIAGRAM
45N779-9, & 15 ---------- SCHEMATIC DIAGRAMS



6	ADMIN CHANGE	DGR			
INC: ADMIN CHANGE PER RIMS: B37 000810 003					
REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE
UNIT 1
CATEGORY 1

MECHANICAL LOGIC DIAGRAM SAFETY INJECTION SYSTEM

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
NUCLEAR ENGINEERING

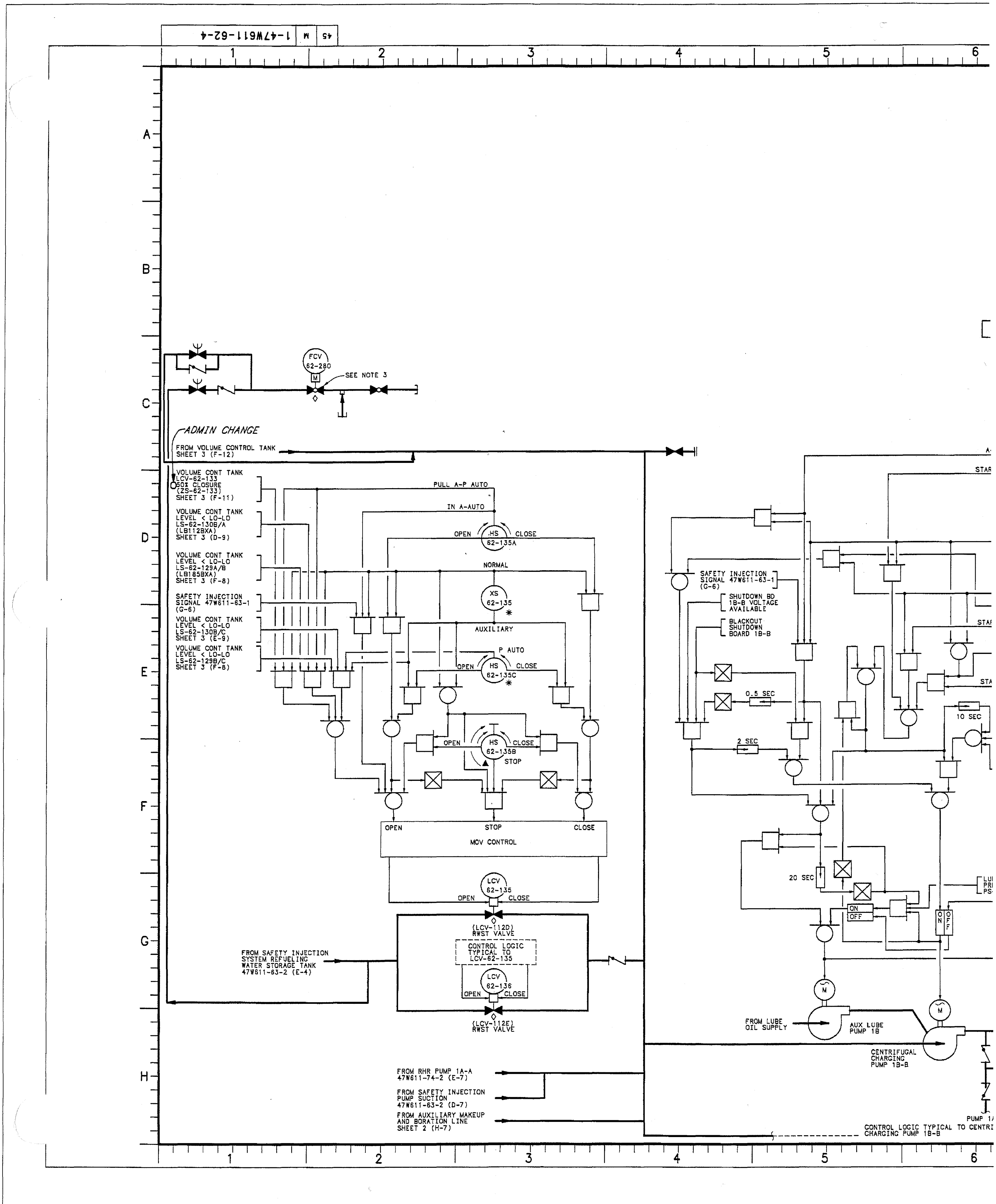
DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: M.T.WALKER	CHECKER: E.MATTHEWS	RD ISSUE PER: CCD REC SHEET NO. 7112. DRAWING MADE A CCD FROM AD-7.	1 B.PAI
DESIGNER: N/A	REVIEWER: P.A.LUNN		2 CRP/MRS
			3 A.G.AILULE
DATE 2-2-88	45 M	CCD NO: 1-47W611-63-4	R6

ISSUED BY: P.G.TRUDEL

CAD MAINTAINED DRAWING

CONTROL ROOM DWG

PULL

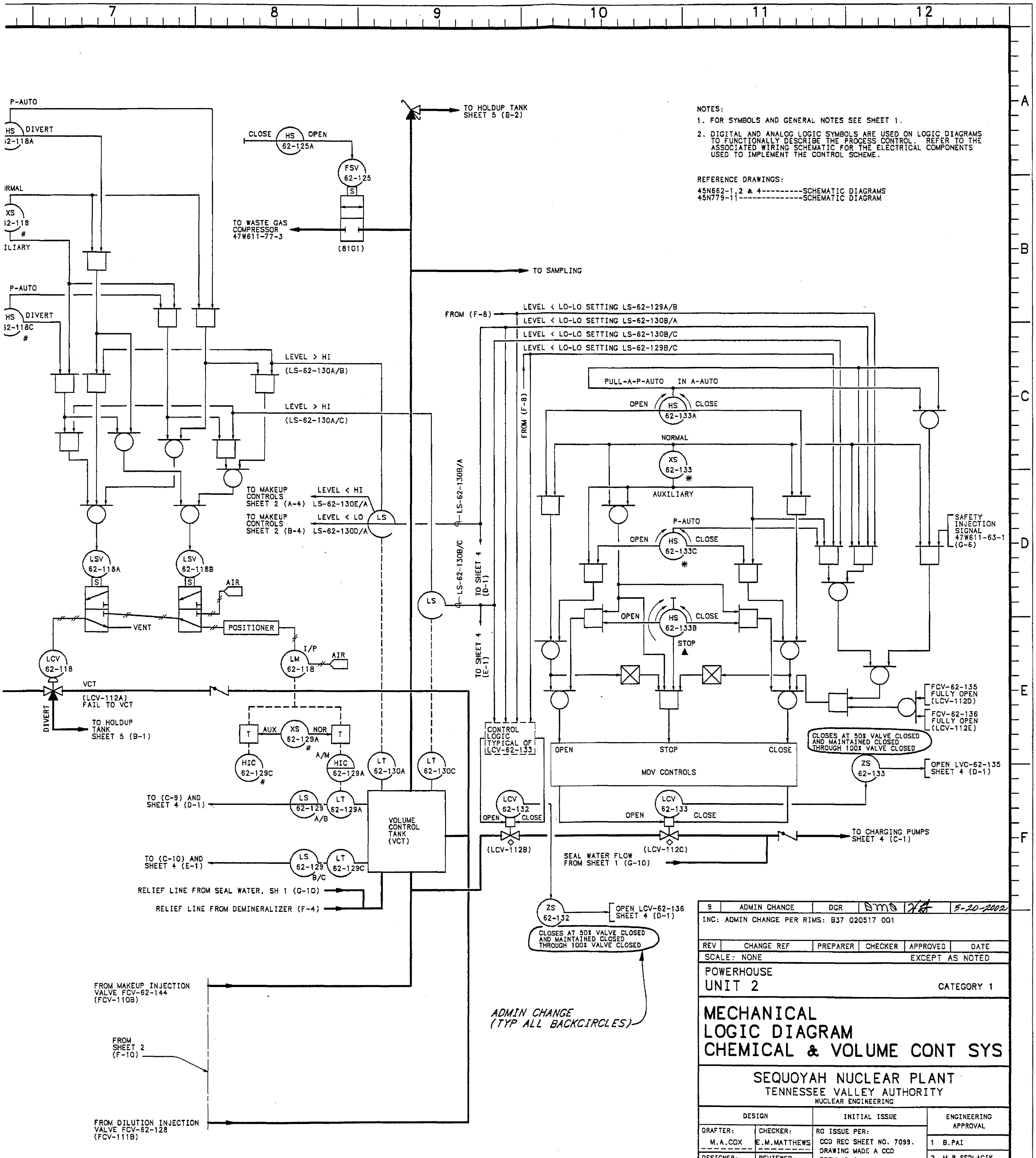

1-47W611-62-4
M
45
FCV 62-280
SEE NOTE 3
ADMIN CHANGE
FROM VOLUME CONTROL TANK SHEET 3 (F-12)
VOLUME CONT TANK LCV-62-133 50% CLOSURE (ZS-62-133) SHEET 3 (F-11)
VOLUME CONT TANK LEVEL < LO-LO LS-62-130B/A (LB112BXA) SHEET 3 (D-9)
VOLUME CONT TANK LEVEL < LO-LO LS-62-129A/B (LB185BXA) SHEET 3 (F-8)
SAFETY INJECTION SIGNAL 47W611-63-1 (G-6)
VOLUME CONT TANK LEVEL < LO-LO LS-62-130B/C SHEET 3 (E-9)
VOLUME CONT TANK LEVEL < LO-LO LS-62-129B/C SHEET 3 (F-8)
PULL A-P AUTO
IN A-AUTO
OPEN
HS 62-135A
CLOSE
NORMAL
XS 62-135
AUXILIARY
P AUTO
HS 62-135C
HS 62-135B
STOP
OPEN STOP CLOSE
MOV CONTROL
LCV 62-135
(LCV-112D) RWST VALVE
CONTROL LOGIC TYPICAL TO LCV-62-135
LCV 62-136
(LCV-112E) RWST VALVE
FROM SAFETY INJECTION SYSTEM REFUELING WATER STORAGE TANK 47W611-63-2 (E-4)
FROM RHR PUMP 1A-A 47W611-74-2 (E-7)
FROM SAFETY INJECTION PUMP SUCTION 47W611-63-2 (D-7)
FROM AUXILIARY MAKEUP AND BORATION LINE SHEET 2 (H-7)
SAFETY INJECTION SIGNAL 47W611-63-1 (G-6)
SHUTDOWN BD 1B-B VOLTAGE AVAILABLE
BLACKOUT SHUTDOWN BOARD 1B-B
0.5 SEC
2 SEC
10 SEC
20 SEC
ON
OFF
FROM LUBE OIL SUPPLY
AUX LUBE PUMP 1B
CENTRIFUGAL CHARGING PUMP 1B-B
CONTROL LOGIC TYPICAL TO CENTRI
CHARGING PUMP 1B-B
PUMP 1
STAR
STA
A B C D E F G H
1 2 3 4 5 6

NOTES:

1. FOR SYMBOLS AND GENERAL NOTES SEE SHEET 1.
2. DIGITAL AND ANALOG LOGIC SYMBOLS ARE USED ON LOGIC DIAGRAMS TO FUNCTIONALLY DESCRIBE THE PROCESS CONTROL. REFER TO THE ASSOCIATED WIRING SCHEMATIC FOR THE ELECTRICAL COMPONENTS USED TO IMPLEMENT THE CONTROL SCHEME.

REFERENCE DRAWINGS:

45N662-1,2 & 4---------SCHEMATIC DIAGRAMS
45N779-11--------------SCHEMATIC DIAGRAM



REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
9	ADMIN CHANGE	DGR	DMS	[illegible]	5-20-2002
INC: ADMIN CHANGE PER RIMS: B37 020517 001					

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE
UNIT 2 CATEGORY 1

MECHANICAL LOGIC DIAGRAM CHEMICAL & VOLUME CONT SYS

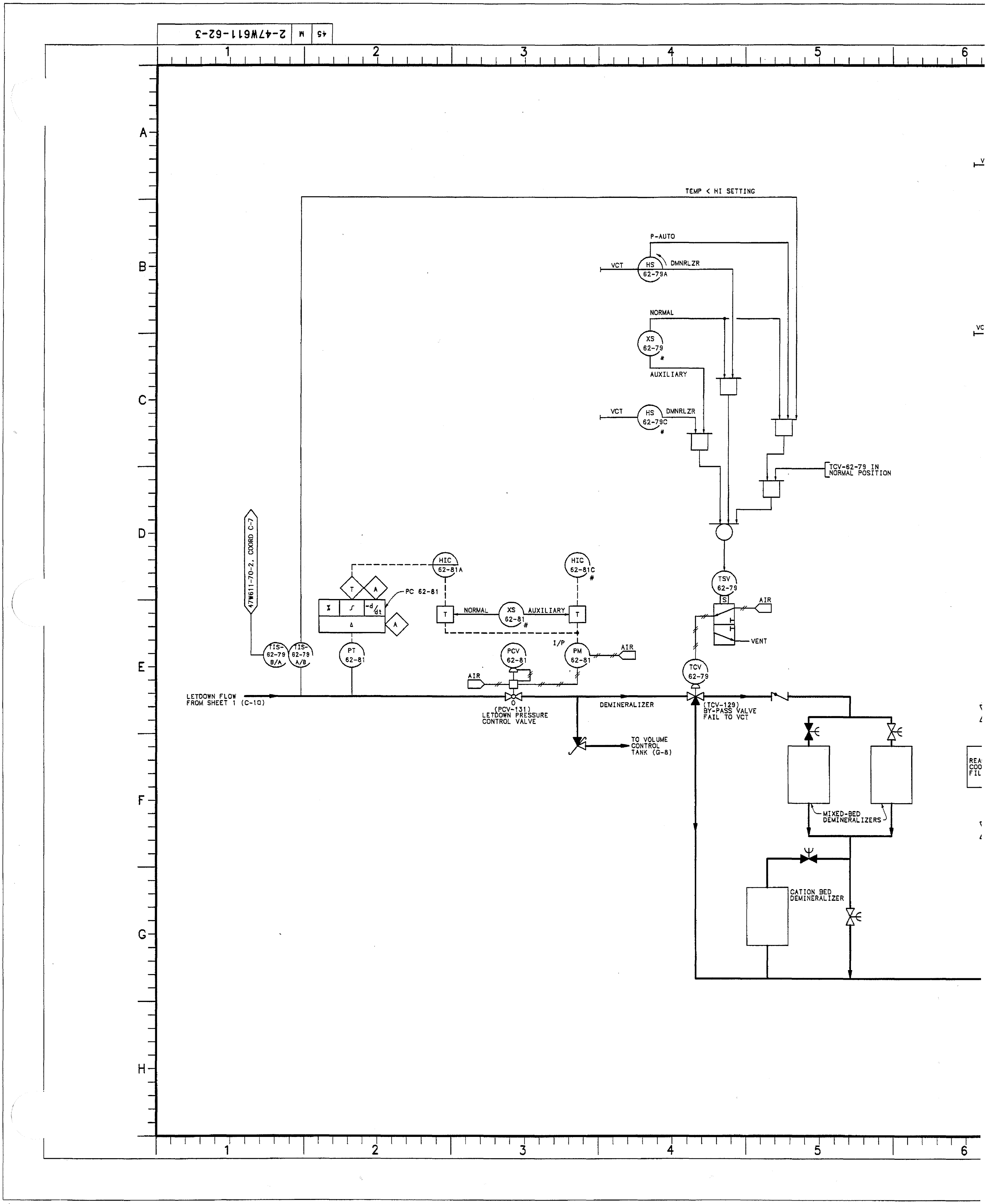
SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
NUCLEAR ENGINEERING

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: M.A.COX	CHECKER: E.M.MATTHEWS	RO ISSUE PER: CCD REC SHEET NO. 7099. DRAWING MADE A CCD FROM AD-6.	1 B.PAI
DESIGNER: N/A	REVIEWER: P.A.LUNN		2 M.R.SEDLACIK
			3 M.A.AGUIRRE
DATE 2-2-89	45 M	CCD NO: 2-47W611-62-3 R9	

ISSUED BY: P.G.TRUDEL

CAD MAINTAINED DRAWING

CONTROL ROOM DWG



2-47W611-62-3
M
45
TEMP < HI SETTING
P-AUTO
VCT
HS 62-79A
DMNRLZR
NORMAL
XS 62-79
AUXILIARY
HS 62-79C
TCV-62-79 IN NORMAL POSITION
47W611-70-2, COORD C-7
HIC 62-81A
HIC 62-81C
PC 62-81
NORMAL
XS 62-81
AUXILIARY
TSV 62-79
AIR
VENT
I/P
PM 62-81
PCV 62-81
TIS-62-79 B/A
TIS-62-79 A/B
PT 62-81
TCV 62-79
LETDOWN FLOW FROM SHEET 1 (C-10)
(PCV-131) LETDOWN PRESSURE CONTROL VALVE
DEMINERALIZER
(TCV-129) BY-PASS VALVE FAIL TO VCT
TO VOLUME CONTROL TANK (G-8)
MIXED-BED DEMINERALIZERS
CATION BED DEMINERALIZER

QUESTIONS REPORT
for BANK SQN Questions

ECCS-B.17.C 001

Given the following plant conditions:

- Unit 2 was operating at 100% power
- A large break LOCA occurred
- Automatic reactor trip and Safety Injection occurred

Which ONE (1) of the following conditions would indicate an ECCS system misalignment during the injection phase?

A.✓ Charging pump mini-flow valves are CLOSED.

B. The Volume Control Tank outlet valves are CLOSED.

C. Charging line isolation valves FCV-62-90 and FCV-62-91 are CLOSED.

D. The Charging Pump Injection Tank discharge valves FCV-63-25 and FCV-63-26 are OPEN.

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** EMERGENCY CORE COOLING SYSTEMS

IV. **LENGTH OF LESSON:** Initial LicenseTraining: 5 hour lecture; 1 hour simulator demonstration; 2 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:

Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Emergency Core Cooling Systems (ECCS) in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge and abilities associated with the ECCS that are rated ≥ 2.5 during Initial License training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the ECCS as described in the SQN FSAR.
2. State the design basis of the ECCS in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the ECCS as illustrated on the simplified system drawing.
4. Describe the following items for each major component in the ECCS:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the ECCS components are designed
   m. Location of controls and indications associated with the ECCS in the control room and auxiliary control room

V. TRAINING OBJECTIVES (Cont'd):

B. Enabling Objectives (Cont'd):

5. Describe the operation of the ECCS as it relates to the following:
   a. Precautions and limitations
   b. Major steps performed while placing the ECCS in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect ECCS operation
   f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the ECCS:
   a. State Tech Specs/TRM LCOs that govern the ECCS
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the ECCS components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events:
   a. PER 93856, Lessons Learned (operability impact of closing FCV-63-47 or -48)
   b. Closure of Suction Valve for a Safety Injection Pump Places Unit 2 in Limiting Condition for Operation 3.0.3
   c. PER 104032, Temperature Control Valve (TCV) stroke testing for ECCS Pump Room Coolers.

VI. TRAINING AIDS:

A. Classroom Computer and Local Area Network (LAN) Access

B. Computer projector

33. 007 A2.05 033

Given the following:

- Unit 1 is operating at 100% power.
- Annunciator Panel 1-XA-55-5A, Window D-1: "PS-68-301 PRESSURIZER RELIEF TANK PRESS HIGH" alarms.
- The OATC observes the following conditions:
  - PRT pressure is 8.5 psig and slowly rising.
  - PRT temperature is 104°F and stable.
  - PRT level is 72%.

Which ONE of the following describes (**1**) the reason for the high pressure and (**2**) the action required?

	(1)	(2)
A.	Nitrogen regulator leak	Reduce PRT pressure by reducing level
B✓	Nitrogen regulator leak	Vent the PRT to the Waste Gas Vent Header
C.	Letdown relief lifted	Reduce PRT pressure by reducing level
D.	Letdown relief lifted	Vent the PRT to the Waste Gas Vent Header

DISTRACTOR ANALYSIS:

High Pressure Alarm annunciates at 8 psig. Temperature and level are within limits and question identifies the temperature is stable and not rising. Neither temperature nor pressure require lowering.

A. *Incorrect, the nitrogen regulator leaking would cause pressure to rise, but the level is lower than the 88% which requires the lowering of level to the normal range of 70%. Plausible because tthe regulator leaking is correct in causing pressure to rise and lowering level will drop pressure.*

B. *CORRECT, the nitrogen regulator leaking would cause the pressure to rise above the alarm limit without causing a change in the PRT temperature or level. The action required would be to vent the PRT to the waste gas system.*

C. *Incorrect, if the letdown relief valve had lifted the temperature and level would be rising along with the pressure and the level is lower than the 88% which requires the lowering of level to the normal range of 70%. Plausible because the letdown relief lifted would cause pressure to rise and loweering the level would cause pressure to drop.*

D. *Incorrect, If the letdown relief valve had lifted the temperature and level would be rising along with the pressure. Venting the the PRT to the waste gas system is correct for the conditions. Plausible because the letdown relief lifted would cause pressure to rise and venting would be appropriate.*

Question No. 33

Tier 2 Group 1

K/A 007 A2.05
Ability to (a) predict the impacts of the following malfunctions or operations on the P S; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Exceeding PRT high-pressure limits

Importance Rating: 3.2 / 3.6

Technical Reference: 1-AR-M5-A, Reactor Coolant - STM - FW, Rev 31
1-SO-68-5, Pressurizer Relief Tank, Rev. 18

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.PZRPCS B.4.e & .j and B.5.c
4. Describe the following items for each major component in the Pressurizer Releif Tank as described in this lesson:
e. Component operation
j. Failure modes
5. Describe the normal, abnormal, and emergency operation of the Presurizer releif Tank as it relates to the following:
c. Alarms and alarm response

Question Source:
Bank # __X_______
Modified Bank # __________
New ________

Question History: WBN bank question 007 A2.02

Question Cognitive Level:
Memory or fundamental knowledge ________
Comprehension or Analysis _X_____

10 CFR Part 55 Content: (41.5 / 43.5 / 45.3 / 45.13)

10CFR55.43.b (n/a)

Comments: WBN Audit Exam

Source

SER 357
1-PS-68-301

Setpoint

8 psig increasing

PS-68-301
PRESSURIZER
RELIEF TANK
PRESS HIGH

Probable Causes

1. Pressurizer safety valve or power relief valve open or leaking through.
2. Nitrogen regulator malfunctioning.
3. Rx vessel head vent leaking through.
4. Relief valves from other systems open or leaking through.
5. Instrument malfunction.

Corrective Actions

[1] **IF** pressurizer relief tank pressure is high, **THEN**
PERFORM the following for possible causes of high pressure:
[a] **CHECK** safety valve and power relief valve line temperatures.
[b] **CHECK** vessel head vent isolation to PRT closed.
[c] **CHECK** nitrogen system.

[2] **REDUCE** pressure in PRT by using 1-SO-68-5, *Pressurizer Relief Tank.*

[3] **IF** a small RCS leak is indicated, **THEN**
GO TO AOP-R.05, *RCS Leak And Leak Source Identification.*

[4] **EVALUATE** TS 3.4.6.2.

References

45B655-05A-0,
45N657-16,
47B601-68-32

Date__________

8.6 Reducing the Pressure of the PRT

[1] **STATION** AUO at panel 0-L-2 to monitor vent header pressure and start Waste Gas Compressor (WGC) if necessary. __________

[2] **OPEN** [1-PCV-68-301]. __________

[3] **WHEN** [1-PI-68-301] is between 3 to 6 psig, **THEN**

CLOSE [1-PCV-68-301]. _____ 1st _____ IV

NOTE: Step **[4]** may be repeated if it is suspected that water remains in waste gas vent header and additional venting is necessary.

[4] **IF** the PRT pressure will not drop while venting or water is suspected to be in waste gas vent header, **THEN**

PERFORM the following:

[a] **NOTIFY** U-1 and U-2 SRO that vent header is about to be vented and to monitor AB area radiation monitors and 0-RM-90-101, AB vent monitor. ☐

[b] **OPEN** [0-LCV-77-403], Loop Dr LCV (653' U1 pipe chase), for 15 seconds, **THEN CLOSE**. __________

[c] **OPEN** [0-LCV-77-404], Loop Dr LCV (653' U1 pipe chase), for 15 seconds, **THEN CLOSE**. __________

[d] **OPEN** [0-LCV-77-405], Loop Dr LCV (669' U2 pipe chase) for 15 seconds, **THEN CLOSE**. __________

END OF TEXT

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** PRESSURIZER PRESSURE CONTROL SYSTEM & PRESSURIZER RELIEF TANK

IV. **LENGTH OF LESSON:** 3.5 hour lecture; 1 hour simulator demonstration; 1 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Pressurizer Pressure Control System & Pressurizer Relief Tank (PRT) in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge and abilities associated with the Pressurizer Pressure Control System & Pressurizer Relief Tank that are rated $\geq$ 2.5 during Initial License training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the Pressurizer Pressure Control System & Pressurizer Relief Tank as described in the SQN FSAR.
2. State the design basis of the Pressurizer Pressure Control System & Pressurizer Relief Tank in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the Pressurizer Pressure Control System & Pressurizer Relief Tank as illustrated on the simplified system drawing.
4. Describe the following items for each major component in the Pressurizer Pressure Control System & Pressurizer Relief Tank as described in this lesson:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the Pressurizer Pressure Control System & PRT components are designed
   m. Location of controls and indications associated with the Pressurizer Pressure Control System &PRT in the control room and auxiliary control room

V. TRAINING OBJECTIVES (Cont'd):

B. Enabling Objectives (Cont'd):

5. Describe the normal, abnormal, and emergency operation of the Pressurizer Pressure Control System & Pressurizer Relief Tank as it relates to the following:
   a. Precautions and limitations
   b. Major steps performed while placing the Pressurizer Pressure Control System & Pressurizer Relief Tank in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect Pressurizer Pressure Control System & Pressurizer Relief Tank operation
   f. How an instrument failure will affect system operation
6. Describe the administrative controls and limits for the Pressurizer Pressure Control System & Pressurizer Relief Tank as explained in this lesson:
   a. State Tech Specs/TRM LCOs that govern the Pressurizer Pressure Control System & Pressurizer Relief Tank.
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the Pressurizer Pressure Control System & Pressurizer Relief Tank components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events:
   a. OE21152: Pressurizer Pressure Control System Design Deficiency with Westinghouse 7100 control system (Turkey Point)
   b. OE22498: Boron Concentration changes when Backup Pressurizer Heaters were Placed in Service (Salem)
   c. Inadvertant Actuation of Pressurizer Spray and Power Operated Relief Valves During Controller Transfer (South Texas Project – U-2)

VI. TRAINING AIDS:

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector

34. 008 A3.04 034

Given the following:

- Both Units are at 100% RTP.
- The CCS System is in a normal alignment with the 1A-A, C-S, and 2B-B pumps in service.
- CCS Pumps 1B-B and 2A-A are in A-AUTO.
- 6.9kv Shutdown Board 1A-A normal feeder breaker trips open spuriously.
- Diesel Generator 1A-A reenergizes Shutdown Board 1A-A followed by the blackout loads sequencing back on.

Which ONE of the following identifies the CCS pumps that are load shed and the pumps that are running after load sequencing is complete?

	Load Shed	Following Load Sequencing
A.	Only the 1A-A	Only 1A-A, C-S, and 2B-B
B.✓	Only the 1A-A	1A-A, 1B-B, C-S, and 2B-B
C.	Both 1A-A & C-S	Only 1A-A, C-S, and 2B-B
D.	Both 1A-A & C-S	1A-A, 1B-B, C-S, and 2B-B

DISTRACTOR ANALYSIS:

A. *Incorrect, Only the 1A-A pump would load shed is correct, however the 1B-B pumps would automatically start due to low pressure when the 1A-A load shed. Plausible because the correct pump is identified for load shedding and the pumps listed would be the ones running if candidate did not relate the automatic start on low pressure for the 1B-B pump.*

B. *CORRECT, Only the 1A-A pump would load shed. When the pump load shed, the pressure would drop and the 1B-B pump automatically start. The 1A-A pump would sequence back on, therefore 4 pumps identified would be running.*

C. *Incorrect, The C-S pump does have an Train A power supply that would be lost when the 1A-A board was de-energized, however the question setup has the power supply coming from the Unit 2 Train B power and the pump would not load shed. Also, the 1B-B pumps would automatically start due to low pressure when the 1A-A load shed. Plausible because the C-S does have an Train A power supply that can be used which would result in its load shedding and the pumps listed would be the ones running if candidate did not relate the automatic start on low pressure for the 1B-B pump.*

D. *Incorrect, The C-S pump does have an Train A power supply that would be lost when the 1A-A board was de-energized, however the question setup has the power supply coming from the Unit 2 Train B power and the pump would not load shed. The 4 pumps identified would be the pumps running. Plausible because the C-S does have an Train A power supply that can be used which would result in its load shedding and the pumps listed would be the ones running.*

Question No. 34

Tier 2 Group 1

K/A 008 A3.04
Ability to monitor automatic operation of the CCWS, including:
Requirements on and for the CCWS for different conditions of the power plant

Importance Rating: 2.9 / 3.2

Technical Reference: 1-47W811-70-1 R20

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.CCS B.5.e
Describe the operation of the Component Cooling Water System. e. How a support system failure will affect Component Cooling Water System operation.

Question Source:
Bank # __________
Modified Bank # __X_______
New ________

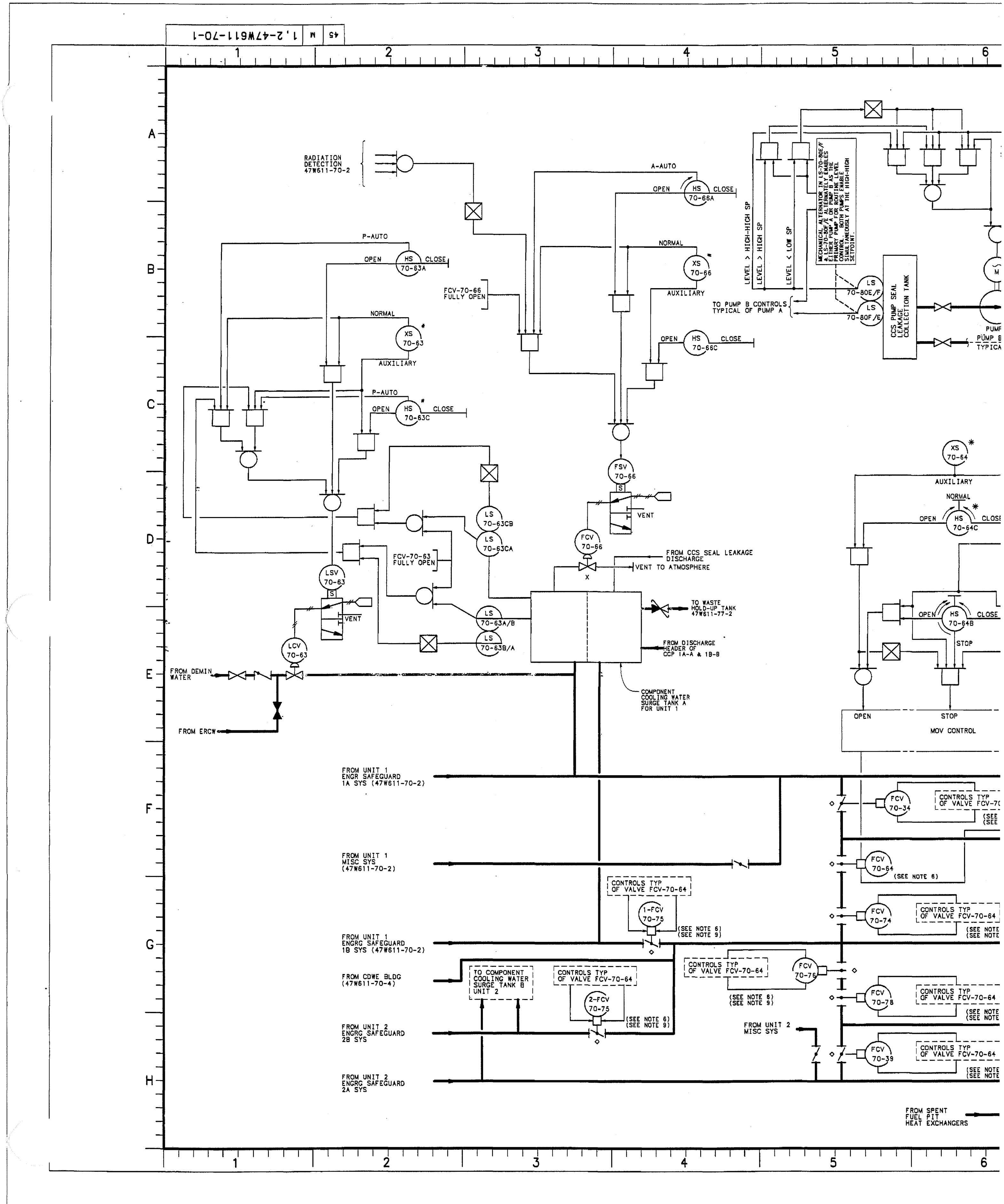
Question History: SQN bank question CCS-B.12.I 002 modified.

Question Cognitive Level:
Memory or fundamental knowledge ________
Comprehension or Analysis __X____

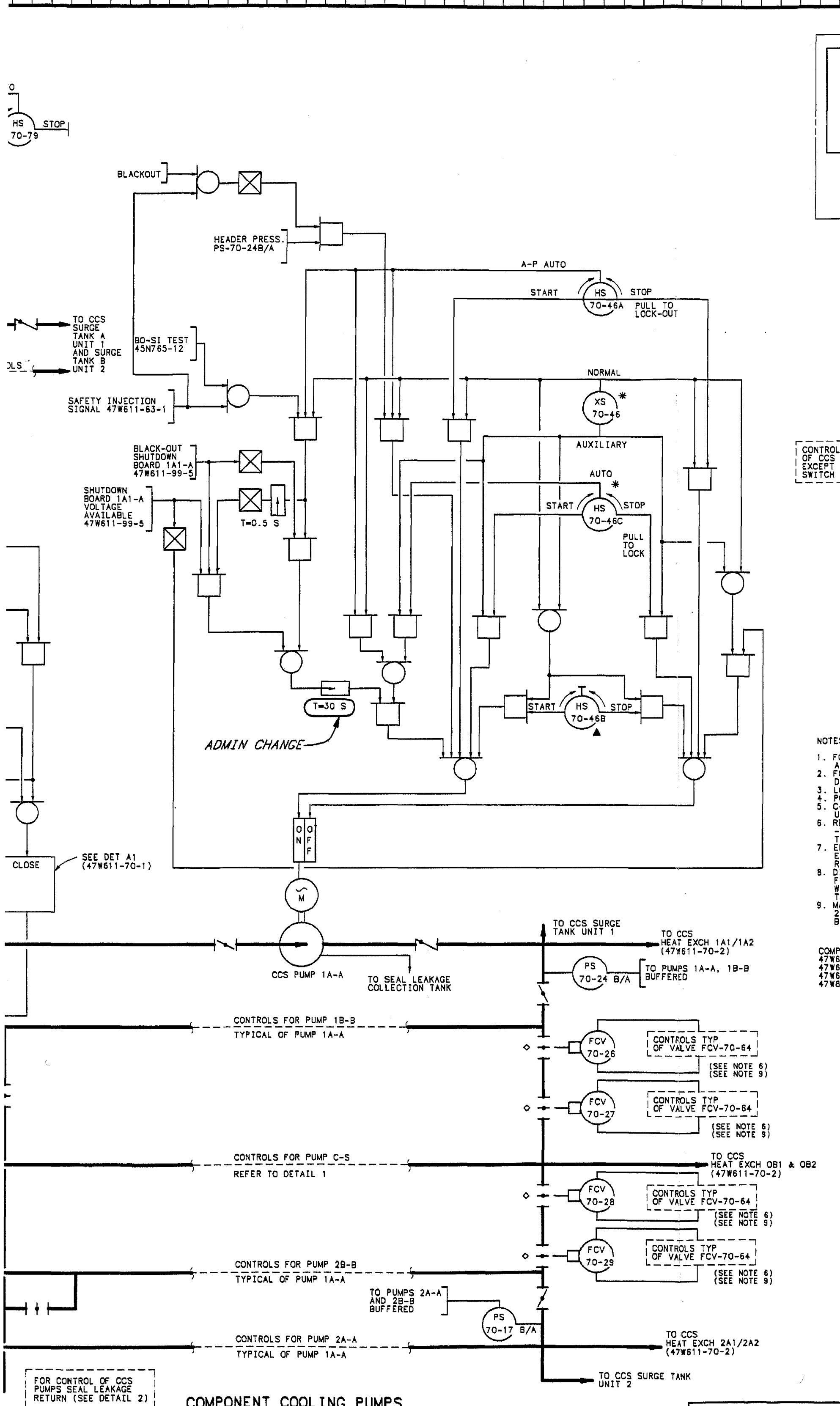
10 CFR Part 55 Content: (41.10 / 45.5)

10CFR55.43.b (n/a)

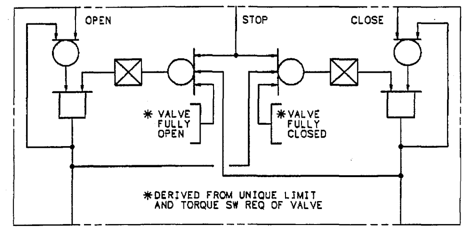
Comments: SQN bank question CCS-B.12.I 002 modified.



1,2-47W611-70-1
M
45
RADIATION DETECTION 47W611-70-2
P-AUTO
OPEN
HS 70-63A
CLOSE
NORMAL
XS 70-63
AUXILIARY
P-AUTO
OPEN
HS 70-63C
CLOSE
A-AUTO
OPEN
HS 70-66A
CLOSE
NORMAL
XS 70-66
AUXILIARY
FCV-70-66 FULLY OPEN
OPEN
HS 70-66C
CLOSE
FSV 70-66
VENT
FCV 70-66
FROM CCS SEAL LEAKAGE DISCHARGE
VENT TO ATMOSPHERE
LS 70-63CB
LS 70-63CA
FCV-70-63 FULLY OPEN
LSV 70-63
VENT
LS 70-63A/B
LS 70-63B/A
LCV 70-63
FROM DEMIN WATER
FROM ERCW
TO WASTE HOLD-UP TANK 47W611-77-2
FROM DISCHARGE HEADER OF CCP 1A-A & 1B-B
COMPONENT COOLING WATER SURGE TANK A FOR UNIT 1
LEVEL > HIGH-HIGH SP
LEVEL > HIGH SP
LEVEL < LOW SP
MECHANICAL ALTERNATOR IN LS-70-80E/F & LS-70-80F/E ALTERNATELY ENABLES EITHER PUMP A OR PUMP B AS THE PRIMARY PUMP FOR ROUTINE LEVEL CONTROL. BOTH PUMPS ENABLE SIMULTANEOUSLY AT THE HIGH-HIGH SETPOINT.
LS 70-80E/F
LS 70-80F/E
TO PUMP B CONTROLS TYPICAL OF PUMP A
CCS PUMP SEAL LEAKAGE COLLECTION TANK
PUMP
PUMP B TYPICA
XS 70-64
AUXILIARY
NORMAL
OPEN
HS 70-64C
CLOSE
OPEN
HS 70-64B
CLOSE
STOP
OPEN
STOP
MOV CONTROL
FROM UNIT 1 ENGR SAFEGUARD 1A SYS (47W611-70-2)
FROM UNIT 1 MISC SYS (47W611-70-2)
FROM UNIT 1 ENGRG SAFEGUARD 1B SYS (47W611-70-2)
FROM CDWE BLDG (47W611-70-4)
FROM UNIT 2 ENGRG SAFEGUARD 2B SYS
FROM UNIT 2 ENGRG SAFEGUARD 2A SYS
TO COMPONENT COOLING WATER SURGE TANK B UNIT 2
CONTROLS TYP OF VALVE FCV-70-64
1-FCV 70-75
(SEE NOTE 6)
(SEE NOTE 9)
2-FCV 70-75
FCV 70-76
FROM UNIT 2 MISC SYS
FCV 70-34
FCV 70-64
(SEE NOTE 6)
FCV 70-74
FCV 70-78
FCV 70-39
FROM SPENT FUEL PIT HEAT EXCHANGERS

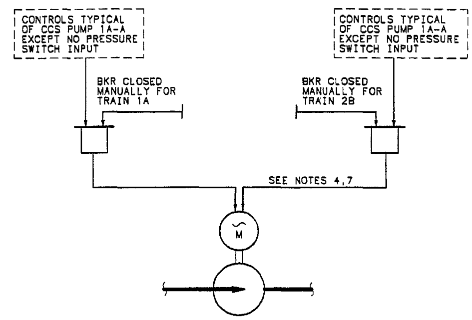


COMPONENT COOLING PUMPS



TYPICAL MOV CONTROL

DETAIL A1



DET 1

NOTES:

1. FOR SYMBOLS OTHER THAN THOSE NOTED ABOVE SEE INSTRUMENTATION AND IDENTIFICATION STANDARDS, LATEST ISSUE.
2. FOR COMPLETE INSTRUMENTATION AND COMPONENT SEPARATION DESIGNATIONS SEE CONTROL DIAGRAM, 47W610-70 SERIES.
3. LOGIC SHOWN FOR UNIT 1, TYPICAL FOR UNIT 2 EXCEPT AS NOTED.
4. POWERED BY TRAIN 2B NORMALLY.
5. C-S PUMP WILL START ON SAFETY INJECTION SIGNAL FROM EITHER UNIT 1 OR UNIT 2.
6. REMOVED PWR FM 1 & 2-FCV-70-75, 1-FCV-70-26,-27,-64, -74, & 2-FCV-70-28,-29,-76 & -78 & 0-FCV-70-39 & -34 BY OPENING THEIR RESPECTIVE ACB ON THE MOV BOARDS.
7. ELECTRICAL INTERLOCK FOR TRAIN 2B DELETED. TRAIN 1A ELECTRICAL INTERLOCK AND MECHANICAL INTERLOCK ON BOTH TRAINS REMAIN ACTIVE.
8. DIGITAL AND ANALOG LOGIC SYMBOLS ARE USED ON LOGIC DIAGRAMS TO FUNCTIONALLY DESCRIBE THE PROCESS CONTROL. REFER TO THE ASSOCIATED WIRING SCHEMATIC FOR THE ELECTRICAL COMPONENTS USED TO IMPLEMENT THE CONTROL SCHEME.
9. MAIN CONTROL ROOM SWITCHES 1-HS-70-26A, -27A, -64A, -74A, -75A, 2-HS-70-28A, -29A, -75A, -76A, -78A, 0-HS-70-34A AND -39A HAVE BEEN REMOVED.

COMPANION DRAWING:
47W611-70-2-3----------LOGIC DIAGRAM
47W611-0-1,2----------LOGIC DIAGRAM INDEX & SYMBOLS
47W610-70 SERIES------CONTROL DIAGRAM
47W859-1,2------------FLOW DIAGRAM

20	ADMIN CHANGE	DGR	DMO	QAW	3-3-05
INC: ADMIN CHANGE PER RIMS: B85 050302 001 THIS RESOLVES PER 77709					
REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE CATEGORY 1
UNITS 1 & 2

MECHANICAL LOGIC DIAGRAM COMPONENT COOLING SYSTEM

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: S R HANCOCK	CHECKER: FRANK DENTON	RO ISSUE PER: DCN S02009A,DCA S02009-12 RO. DRAWING MADE A CCD FROM AC-N/A & AD-R13. THIS CCD RESOLVES DRAWING DEVIATION 89D04405.	1 N/A
DESIGNER: N/A	REVIEWER: N/A		2 FRANK DENTON
			3 M.R.SEDLACIK

ISSUED BY: N/A

DATE 11/07/90 | 45 | M | CCD NO:1,2-47W611-70-1 R20

CAD MAINTAINED DRAWING

CONTROL ROOM DWG

CCS-B.12.I 002

Given the following plant conditions:

- 1A-A, 2B-B, and C-S CCS pumps are normally aligned and running
- 1B-B and 2A-A CCS pumps are aligned in Standby Auto
- Unit 1 experiences a loss of both 6.9 kV Start Buses
- 1A-A and 1B-B D/Gs load normally on the 6.9 kV Shutdown Boards

Which ONE (1) of the following describes the response of the CCS system to these conditions?

A. All running CCS pumps will be load shed and will automatically start when the shutdown boards are energized.

B. 1A-A and C-S CCS pumps will be load shed and will automatically start when the shutdown boards are energized.

C✓ 1A-A CCS pump will be load shed, 1A-A and 1B-B CCS pumps will automatically start when the shutdown boards are energized.

D. 1A-A and C-S CCS pumps will be load shed, 1A-A, 1B-B and C-S CCS pumps will automatically start when the shutdown boards are energized

C-S pump won't load shed, it is normally supplied power from U-2 power supply.

K/A: 008 K4.01 3.1/3.3

Reference: 1,2-47W611-70-1

Objective: OPL271CCS, B.12.i

History:

Level: Analysis

Note:

HLC 0108:	611-70-1	HLC 0109:	ILT PRO2
HLC 2006:		LOR Cycle Exam:	0080090101
Last Biennial Exam:		Part B (Y/N):	
SRO only [Y/N]:		Category 8:	

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** COMPONENT COOLING WATER SYSTEM

IV. **LENGTH OF LESSON:** 2.0 hour lecture; 1 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Component Cooling Water System in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with the Component Cooling Water System that are rated $\geq$ 2.5 during Initial License Training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the Component Cooling Water System as described in the FSAR.
2. State the design basis of the Component Cooling Water System in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the Component Cooling Water System as illustrated on a simplified system drawing.
4. Describe the following characteristics of each major component in the Reactor Component Cooling Water System.
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the Component Cooling Water System components are designed
   m. Location of controls and indications associated with the Component Cooling Water System in the control room and auxiliary control room

V. **TRAINING OBJECTIVES (Cont'd):**

B. Learning Objectives (Cont'd):

5. Describe the operation of the Component Cooling Water System:
   a. Precautions and limitations
   b. Major steps performed while placing the Component Cooling Water System in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect Component Cooling Water System system operation
   f. How an instrument failure will affect system operation
6. Describe the administrative controls and limits for the Component Cooling Water System:
   a. State Tech Specs/TRM LCOs that govern the Component Cooling Water System
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the Component Cooling Water System components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events
   a. SOER 84-01, "Cooling Water System Degradation Due To Aquatic Life"
   b. PER 03-002546-000, Loss of U-2 Thermal Barrier Hx Cooling Due To Automatic Isolation On Flow During Fill Of CCS Piping

VI. **TRAINING AIDS:**

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)

35. 008 K1.04 035
Given the following:

- Unit 1 is at 100% power.
- VCT pressure is at 18 psig.

Which ONE of the following identifies the location of a CCS leak that would result in the condition listed below?

LEAK LOCATION	**CONDITION**
A. RCP Thermal Barrier	TBBP in A-P auto starts
B✓ Letdown Heat Exchanger	CCS Rad Monitor rising
C. RHR 1B-B Heat Exchanger	CCS Surge Tank level rising
D. Seal Return Heat Exchanger	VCT level dropping

DISTRACTOR ANALYSIS:

A. Incorrect, A leak in the Thermal Barrier would result in RCS leakage into the CCS. The leakage could cause the thermal barrier to isolate and trip the TBBPs, not start the. Plausible because when the thermal barrier isolates a low flow condition would exist which sends a start to the pump in A-P Auto but the pump cannot start due to the trip signal also being present.

B. CORRECT, A leak in the Letdown Heat Exchanger would cause RCS in-leakage via the letdown into the CCS system causing a rise in the radiation in the CCS because at the Letdown Heat Exchanger the letdown pressure is higher than the CCS pressure.

C. Incorrect, A leak in the RHR 1B-B heat exchanger would result in out-leakage from the CCS making the Surge Tank level drop instead of rise. Plausible because with conditions different than stated in the stem the pressure could be higher in the RHR heat exchanger and the CCS Surge tank level would rise.

D. Incorrect, A leak in the seal water heat exchanger which cools the RCS seal leakoff would result in out-leakage from the CCS making the Surge Tank level drop but the VCT level would rise, not drop. Plausible because the VCT level would drop if the Seal Return pressure were greater than the CCS pressure.

Question No. 35

Tier 2 Group 1

K/A 008 K1.04
Knowledge of the physical connections and/or cause-effect relationships between the CCWS and the following systems: RCS, in order to determine source(s) of RCS leakage into the CCWS

Importance Rating: 3.3 / 3.3

Technical Reference: 1-SO-70-1, Component Cooling Water System "A"Train, Rev 43
1-SO-62-1, Chemical and Volume Control System, Rev 55

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.CCS B.5.d
Describe the operation of the Component Cooling Water System: d. How component failure will affect system operation.

Question Source:
Bank # __________
Modified Bank # __________
New _X______

Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge ________
Comprehension or Analysis _X_____

10 CFR Part 55 Content: (41.2 to 41.9 / 45.7 to 45.9)

10CFR55.43.b (n/a)

Comments: New

3.0 PRECAUTIONS AND LIMITATIONS

A. Failure to observe all posted radiation control requirements may result in unnecessary radiation absorbed dose.

B. Any CCS components to be placed in service must be properly filled and vented.

C. If CCS piping is removed from service, it will be filled and vented under the clearance procedure.

D. Maximum system pressure is 150 psi**g**.

E. Water to CCS pump's suction must be maintained $<$ 200°F.

F. CCS pump's developed head (discharge pressure - suction pressure) must be maintained at $>$ 76 psi**g,** but $\leq$ 100 psi**g** by controlling number of pumps operating and number of HXs in service. This will ensure flow through each pump is maintained $\geq$ 3500 gp**m**, but $<$ 7000 gp**m**.

G. ERCW cooling must be established through CCS Hx prior to heat load being placed on HX.

H. During normal operation, CCS supply header temperature must not exceed 100°F at outlet of CCS HX.

I. When additional cooling loads are added to CCS, flow rates to components already being cooled must be checked and CCS flow adjusted accordingly.

J. Since CCS may be radioactively contaminated, RADCON must be notified prior to breaching the system and any time system leakage is detected.

K. To maintain unit's CCS inventory constant, CCS supply and return for Spent Fuel Pit (SFP) HXs must be aligned to same unit. When swapping SFP heat load between units, supply and return should be changed simultaneously.

L. DO NOT CLOSE valves 1-FCV-70-3 or 1-FCV-70-75 unless B Train CCS is removed from service, i.e., CCS pump shutdown, to avoid abnormal CCS surge tank level changes.

M. If planning for liquid draining operations and liquid will not be drained to a container and disposed of in accordance with existing plant procedures, then contact Environmental to obtain guidance on where the liquid should be drained. Chemicals in Systems 67 and 70 can affect plant waste water processing and may present off site environmental concerns.

3.0 PRECAUTIONS AND LIMITATIONS

A. Failure to observe all posted radiation control requirements may lead to unnecessary radiation absorbed doses.

B. The maximum design flowrate through the mixed bed demineralizers is 120 gpm, except during RCS cleanup in Modes 5 and 6. 0-GO-7 contains requirements for raising letdown flow to 180 gpm during outages.

C. 1-TCV-62-79 (letdown temperature divert valve) should be in bypass position if the temperature reaches 140°F or if hydrazine is being used for O_2 scavenging.

D. Decreasing VCT pressure below 13 psig when RCPs are operating may damage RCP seals. Westinghouse recommendation for minimum 15 psig backpressure for No. 1 RCP is satisfied with a VCT pressure of 13 psig. This is due to the pressure drop between no. 1 seal leakoff and the VCT, including seal return filter, seal return heat exchanger and piping delta p.

E. If the reactor coolant letdown filter is bypassed, the letdown demineralizers need to be bypassed to prevent resins from entering the RCS in the event of a resin screen failure. **[C.3]**

F. Whenever the plant is in solid water operation with letdown from RHR, the RHR letdown control valve 1-FCV-62-83 should be full open with pressure maintained with 1-PCV-62-81. COPS must be operable when RCS temperature is < 350°F. If both trains of COPS are operable, then the letdown orifices may be closed. **[C.2]**

G. Seal injection flow to the RCPs should be maintained at all times when the loops are being filled and thereafter preventing any dirt or particles from entering the #1 seals.

H. When the RCS temperature is < 350°F in mode 4, 5 or 6 with reactor vessel head installed, one centrifugal charging pump shall be incapable of injection into the RCS (LCO 3.4.12).

I. Two CCPs may be in operation for the purpose of swapping pumps only if the RCS is NOT water solid and requirements of 3.4.12 (time for swapping pumps) are met.

Date__________

5.2 Establishing CVCS Letdown (Continued)

CAUTION **Step [7] needs to be performed immediately after step [6] is completed to prevent flashing in letdown line.**

[6] **OPEN** one or more of the following letdown orifice isolation valves: (**N/A** ones not used)

VALVE	INITIALS
1-FCV-62-72	________
1-FCV-62-73	________
1-FCV-62-74	________

NOTE Normal letdown pressure is 325 psi**g** at operating temperature.

[7] **ADJUST** **[1-HIC-62-81A]** to obtain desired letdown pressure, as indicated on **[1-PI-62-81]**. __________

[8] **PLACE** **[1-HIC-62-81A]** in **AUTO**. __________

NOTE Normal letdown temperature is ~100°F.

[9] **ADJUST** **[1-HIC-62-78A]** to obtain desired letdown temperature, as indicated on **[1-TI-62-78]**. __________

[10] **PLACE** **[1-HIC-62-78A]** in **AUTO.** __________

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** CHEMICAL AND VOLUME CONTROL

IV. **LENGTH OF LESSON:** 4 hour lecture; 1 hour simulator demonstration; 1 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Chemical and Volume Control (CVCS) system in the plant and on the simulator.

B. Learning Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge and abilities associated with the CVCS system that are rated $\geq$ 2.5 during Initial License Training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the CVCS system as described in the FSAR.
2. State the design basis of the CVCS system in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the CVCS system as illustrated on a simplified system drawing.
4. Describe the following characteristics of each major component in the CVCS system:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the CVCS system components are designed
   m. Location of controls and indications associated with the CVCS system in the control room and auxiliary control room

V. TRAINING OBJECTIVES (Cont'd):

B. Learning Objectives (Cont'd):

5. Describe the operation of the CVCS system:
   a. Precautions and limitations
   b. Major steps performed while placing the CVCS system in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect CVCS system operation
   f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the CVCS system:
   a. State Tech Specs/TRM LCOs that govern the CVCS
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the CVCS system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events

VI. TRAINING AIDS:

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)

36. 010 A.2.01 036

Given the following:

- Unit 1 is at 100% power.
- Pressurizer pressure is 2235 psig with both spray valves closed.
- Only Control Group "D" heater is energized.
- Control Group "D" heater breaker subsequently trips.
- Pressurizer pressure drops until the backup heaters energize before any operator action is taken.

Which ONE of the following identifies the correct operation of 1-PIC-68-340A, PZR Pressure Control and the pressure control system to stabilize pressure at 2235 psig.

A. Place 1-PIC-68-340A in MANUAL and lower the output to maintain backup heaters energized and allow spray valves to operate in AUTO.

B. Place 1-PIC-68-340A in MANUAL and raise the output to maintain spray valves open and allow all backup heaters to remain energized.

C. Leave 1-PIC-68-340A in AUTO and raise the setpoint to allow backup heaters to maintain pressure at approximately 2235 psig.

D✓ Leave 1-PIC-68-340A in AUTO and allow the spray valves to modulate in automatic to control pressure at 2235 psig.

<u>*DISTRACTOR ANALYSIS:*</u>

A. Incorrect, The backup group A and B heaters would energize and de-energize resulting in the cycling of pressure from 2210 to 2218 psig, but Backup Group C does not de-energize on increasing pressure, thus the pressure continues to increase. Plausible because the backup heaters A and B do cycle between the 2210 and 2218 psig and because the master controller setpoint can be operated in manual for other failures/conditions and lowering the output sufficiently would keep the backup heaters A and B heaters on. However this action would prevent the spray valves from being able to open automatically.

B. Incorrect, the spray valves start coming open to maintain pressure is correct due to the Backup Group C not de-energizing on increasing pressure, thus the pressure continues to increase and the spray valves start coming open to maintain pressure. The master controller would not be placed to manual to keep spray valve open because that would prevent the backup heaters from energizing. Plausible because the master controller setpoint can be operated in manual for other failures/conditions and raising the output sufficiently would keep the spray valves open but this would prevent the backup heaters from being re-energized if needed.

C. Incorrect, The backup group A and B heaters would energize and de-energize resulting in the cycling of pressure from 2210 to 2218 psig, but the Backup Group C does not de-energize on increasing pressure, thus the pressure continues to increase. Operating the master controller in automatic is correct but the setpoint is not changed. Plausible because the backup heaters A and B do cycle between the 2210 and 2218 psig and because the master controller setpoint can be changed which would change the setpoint at which the backup heaters energize.

D. CORRECT, After the backup heaters energize, the pressure will be increasing. The backup group A and B heaters will de-energize when the pressure reaches 2218 psig but the Backup Group C does not de-energize on increasing pressure, thus the pressure continues to increase and the spray valves start coming open to maintain pressure. The master contoller being in automatic is what allows the spray valves to start coming open through the integral action of the controller the pressure will stabilize at 2235 psig.

Question No. 36

Tier 2 Group 1

K/A 010 A.2.01
Ability to (a) predict the impacts of the following malfunctions or operations on the PZR PCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Heater failures

Importance Rating: 3.3 / 3.6

Technical Reference: AOP-I.04, Pressurizer Instrument and Control Malfunctions, Rev 9
TI-28 Att. 9, Unit 1 & 2 Cycle Data Sheet, Effective Date: 06-28-07

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200PZRPCS B.5.d
Describe the normal. abnormal, and emergency Operation of the Pressurizer Pressure Control System & Pressurizer Relief Tank System as it relates to the following: d. How a component faillurewilll affect system operation.

Question Source:
Bank # __________
Modified Bank # __________
New __X_____

Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge ________
Comprehension or Analysis _X_____

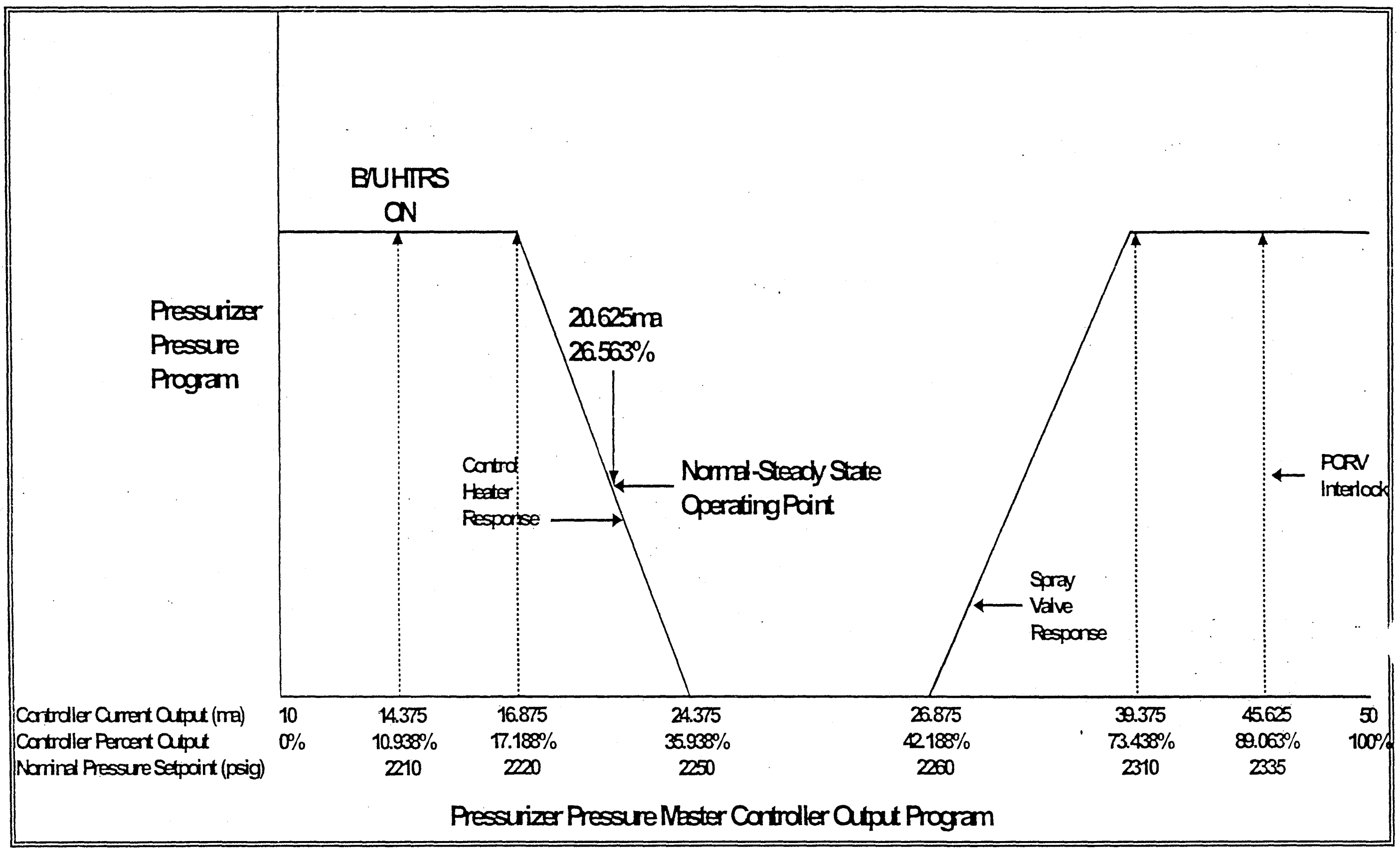
10 CFR Part 55 Content: (41.5 / 43.5 / 45.3 / 45.13)

10CFR55.43.b (n/a)

Comments:

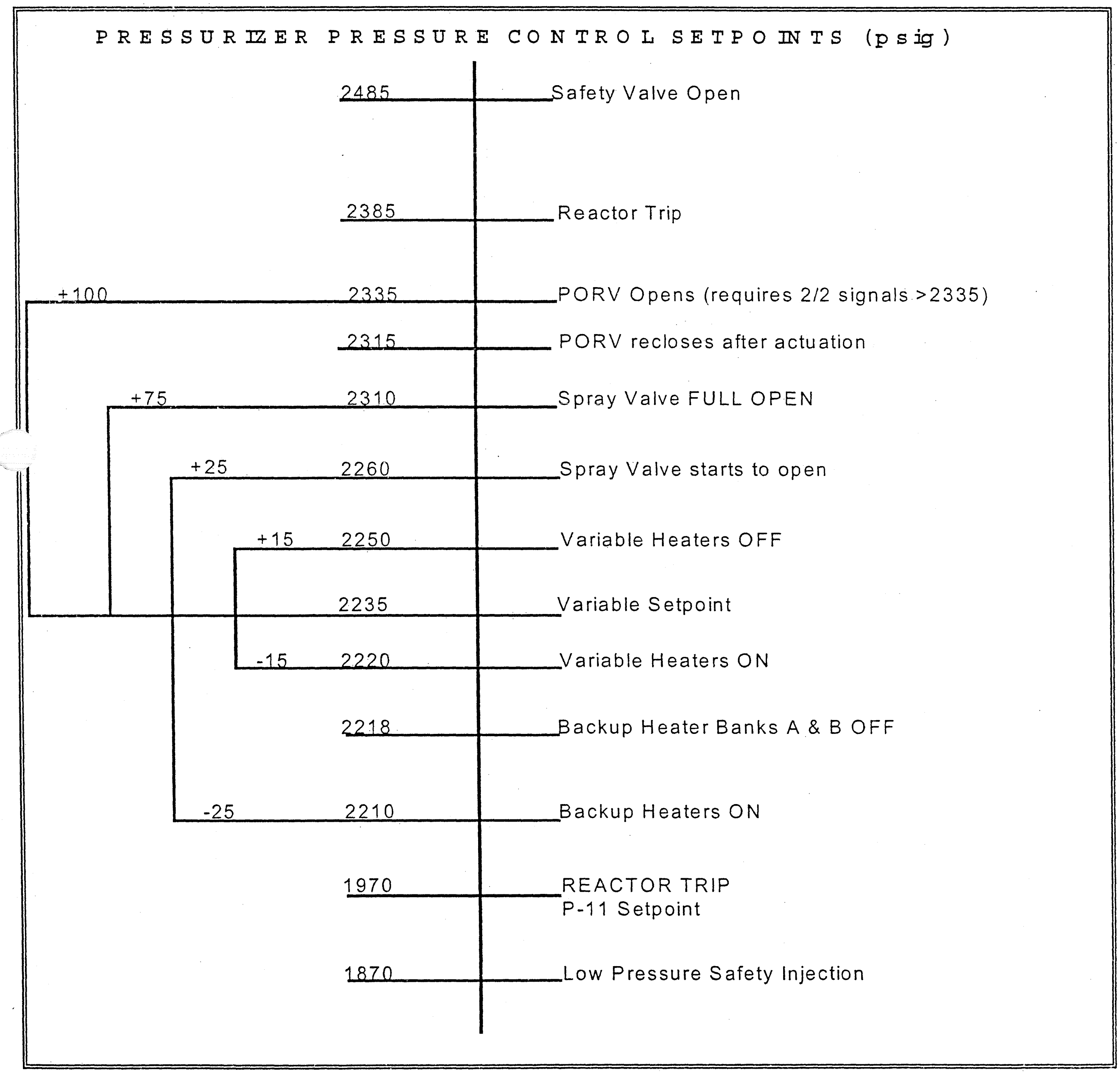
APPENDIX L

PRESSURIZER PRESSURE CONTROL



APPENDIX L

PRESSURIZER PRESSURE CONTROL



I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** PRESSURIZER PRESSURE CONTROL SYSTEM & PRESSURIZER RELIEF TANK

IV. **LENGTH OF LESSON:** 3.5 hour lecture; 1 hour simulator demonstration; 1 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Pressurizer Pressure Control System & Pressurizer Relief Tank (PRT) in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge and abilities associated with the Pressurizer Pressure Control System & Pressurizer Relief Tank that are rated $\geq$ 2.5 during Initial License training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the Pressurizer Pressure Control System & Pressurizer Relief Tank as described in the SQN FSAR.
2. State the design basis of the Pressurizer Pressure Control System & Pressurizer Relief Tank in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the Pressurizer Pressure Control System & Pressurizer Relief Tank as illustrated on the simplified system drawing.
4. Describe the following items for each major component in the Pressurizer Pressure Control System & Pressurizer Relief Tank as described in this lesson:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the Pressurizer Pressure Control System & PRT components are designed
   m. Location of controls and indications associated with the Pressurizer Pressure Control System &PRT in the control room and auxiliary control room

V. TRAINING OBJECTIVES (Cont'd):

B. Enabling Objectives (Cont'd):

5. Describe the normal, abnormal, and emergency operation of the Pressurizer Pressure Control System & Pressurizer Relief Tank as it relates to the following:
   a. Precautions and limitations
   b. Major steps performed while placing the Pressurizer Pressure Control System & Pressurizer Relief Tank in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect Pressurizer Pressure Control System & Pressurizer Relief Tank operation
   f. How an instrument failure will affect system operation
6. Describe the administrative controls and limits for the Pressurizer Pressure Control System & Pressurizer Relief Tank as explained in this lesson:
   a. State Tech Specs/TRM LCOs that govern the Pressurizer Pressure Control System & Pressurizer Relief Tank.
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the Pressurizer Pressure Control System & Pressurizer Relief Tank components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events:
   a. OE21152: Pressurizer Pressure Control System Design Deficiency with Westinghouse 7100 control system (Turkey Point)
   b. OE22498: Boron Concentration changes when Backup Pressurizer Heaters were Placed in Service (Salem)
   c. Inadvertant Actuation of Pressurizer Spray and Power Operated Relief Valves During Controller Transfer (South Texas Project – U-2)

VI. TRAINING AIDS:

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector

37. 012 K2.01 037

Given the following:

- Unit 1 is at 100% power.
- A loss of 125V DC Vital Battery Board I occurs.

Which ONE of the following describes the effect on Main Control Board (MCB) indication and the associated Reactor Trip Breaker?

A.✓ MCB indication is lost and the reactor trip breaker is NOT capable of tripping on a SHUNT trip.

B. MCB indication is lost and the reactor trip breaker trips OPEN due to loss of power to the SHUNT coil.

C. MCB indication remains lit. The reactor trip breaker is NOT capable of tripping on a SHUNT trip.

D. MCB indication remains lit. The reactor trip breaker trips OPEN due to loss of power to the SHUNT coil.

DISTRACTOR ANALYSIS:

A. CORRECT, 125V DC supplies control power to RTB indication and also shunt trip mechanism. Without this power, indication is lost and the shunt trip feature of the RTB is disabled.

B. Incorrect, The MCB indication is lost but shunt trip is required to be energized to actuate. Plausible because the lost of MCB indication is correct and a power loss to the UV coils would cause a trip.

C. Incorrect, MCB indication is lost, because control power for breaker indication is supplied by 125V DC. Plausible if the power supply to the shunt trip is not associated with the power supply to the MCB indication and the second part of the distractor is correct (the RTB is not capable of tripping on a shunt trip).

D. Incorrect, MCB indication is lost, because control power for breaker indication is supplied by 125V DC. Plausible if the power supply to the shunt trip is not associated with the power supply to the MCB indication and a power loss to the UV coils would cause a trip.

Question No. 37

Tier 2 Group 1

K/A 012 K2.01
Knowledge of bus power supplies to the following: RPS channels, components, and interconnections.

Importance Rating: 3.3 / 3.7

Technical Reference: 1, 2-45N699-1 R9

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.RPS B.5.e
Describe the operation of the Reactor Protection & Engineered Safety Features Actuation Systems:
e. How a support system failure will effect system operation.

Question Source:
Bank # __X_______
Modified Bank # __________
New ________

Question History: WBN Bank question 012 K2.01 002

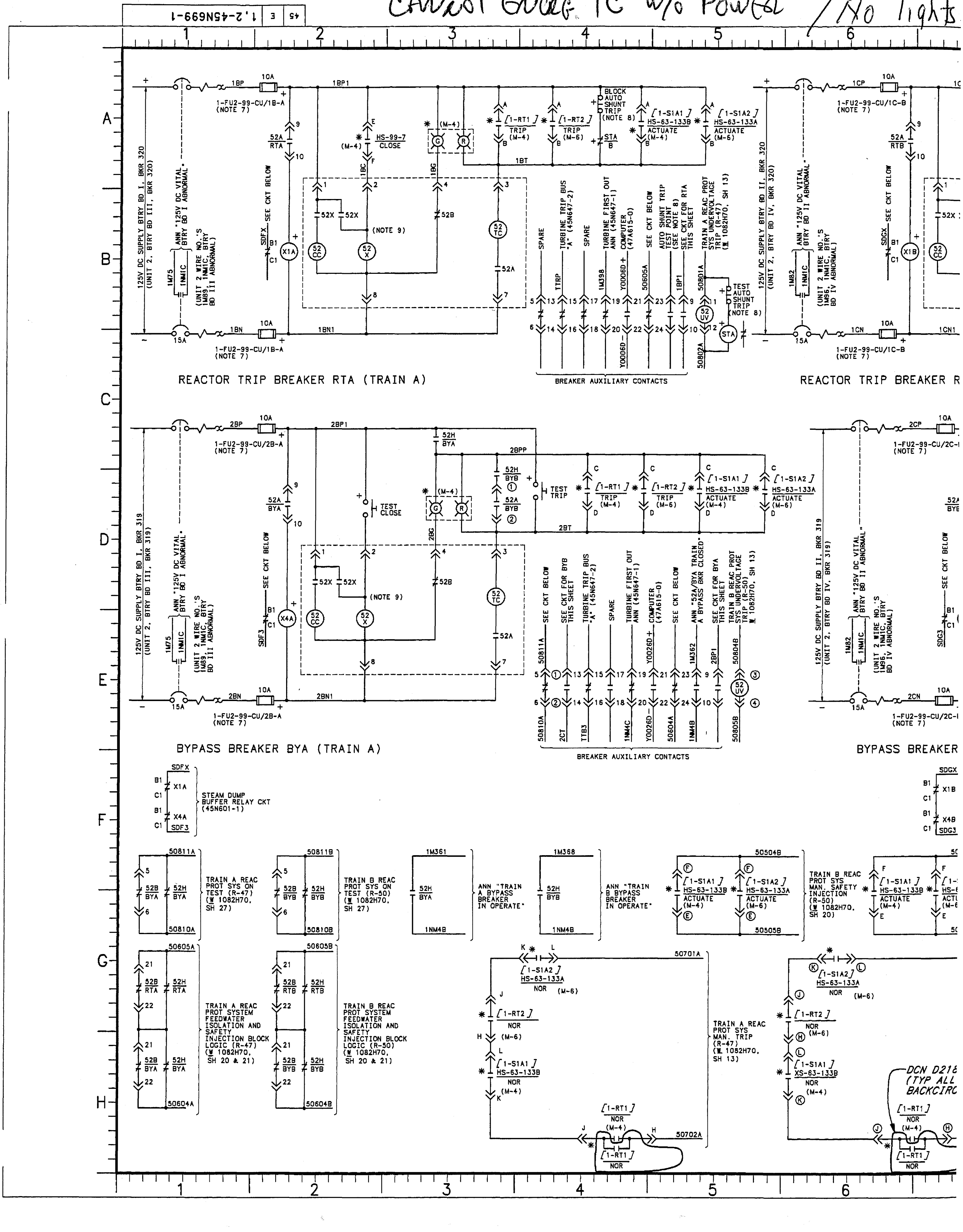
Question Cognitive Level:
Memory or fundamental knowledge _______
Comprehension or Analysis __X____

10 CFR Part 55 Content: (41.7)

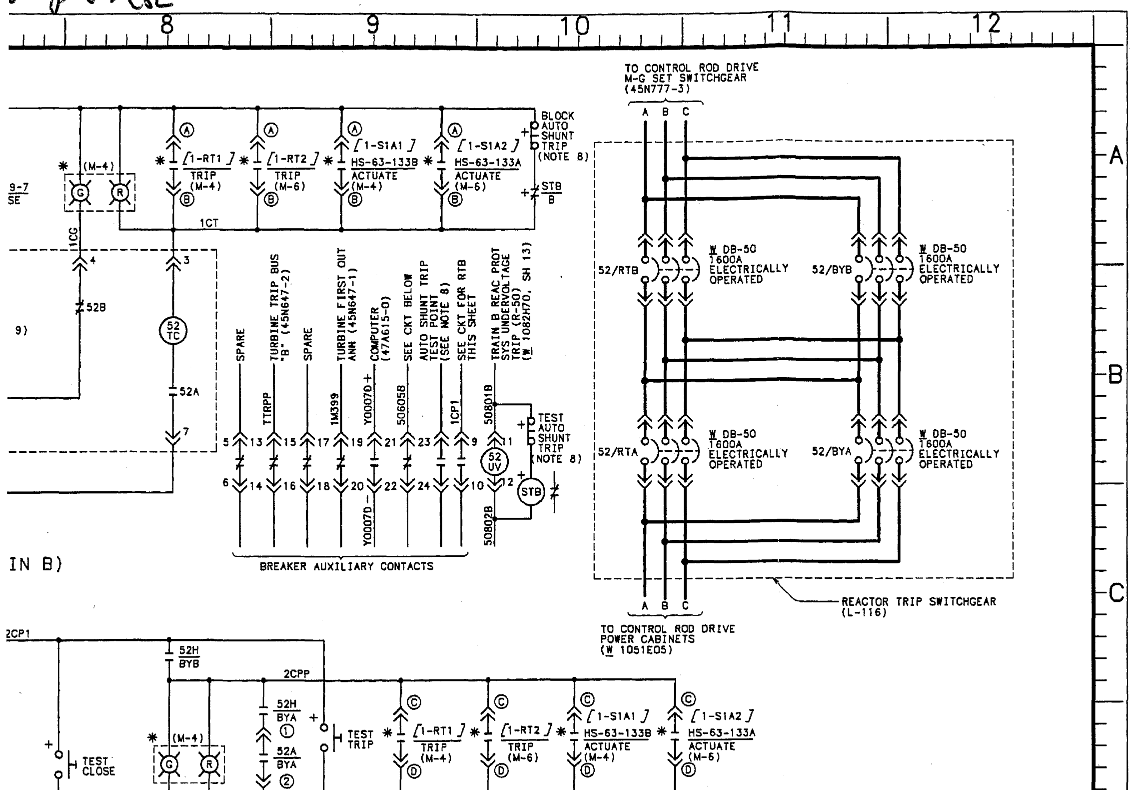
10CFR55.43.b (n/a)

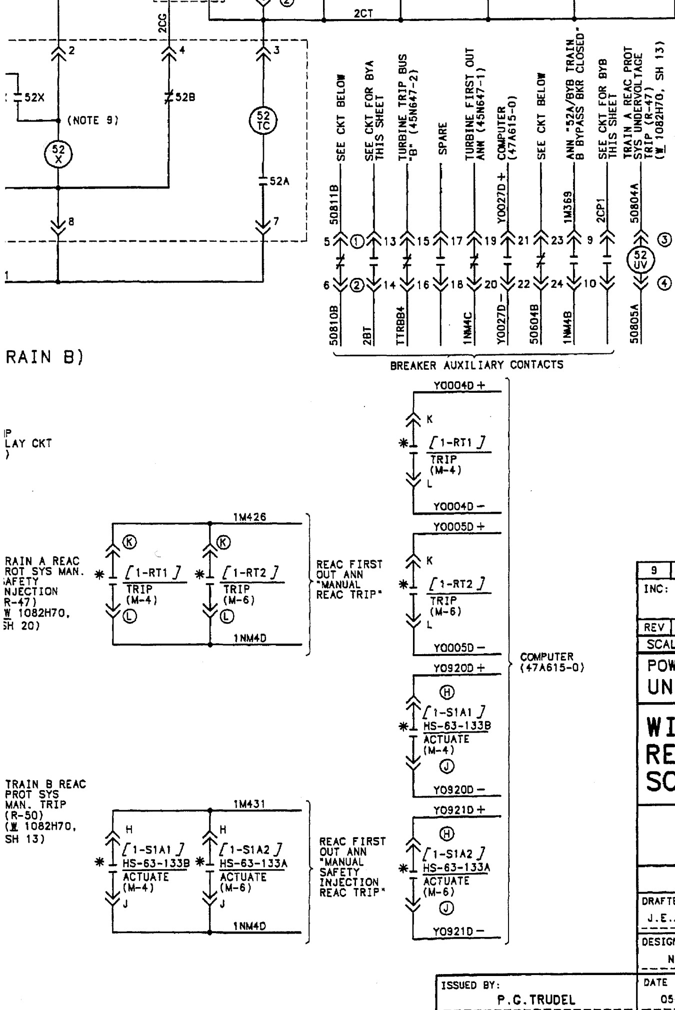
Comments: WTSI bank WBN Audit Exam

CANNOT ENERG "TC" w/o POWER / NO lights



) power





NOTES:

1. DESIGNATIONS ENCLOSED WITH BRACKETS [ ] ARE MANUFACTURER'S DEVICE NUMBERS PER TVA CONTRACT 68C60-91934. DESIGNATIONS ENCLOSED WITH PARENTHESIS () ARE PANEL NUMBERS WHERE DEVICES ARE LOCATED.
2. CONTROL SWITCH PIN LETTERS INSIDE A CIRCLE ARE ON SWITCH MODULE CONNECTOR P2; ALL OTHERS ARE ON P1.
3. CIRCUIT BREAKER NOMENCLATURE:
   - 52CC --- CLOSING COIL
   - 52X ---- CONTROL RELAY
   - 52TC --- TRIP COIL
   - 52UV --- UNDERVOLTAGE TRIP COIL
   - 52H ---- CELL SWITCH (SHOWN IN TEST OR DISCONNECTED POSITION)
4. NORMAL OPERATION OF THE REACTOR TRIP SWITCHGEAR IS WITH THE REACTOR TRIP BREAKERS RTA AND RTB IN SERVICE AND THE BYPASS BREAKERS BYA AND BYB WITHDRAWN. THE BYPASS BREAKER FOR EACH TRAIN WILL BE CLOSED ONLY WHEN THE RESPECTIVE REACTOR TRIP BREAKER IS TO BE TESTED, AND ONLY ONE BYPASS BREAKER MAY BE CLOSED AT ONE TIME. IF BOTH BYPASS BREAKERS ARE CLOSED AT ONE TIME, EACH WILL TRIP THE OTHER, RESULTING IN A REACTOR TRIP. AT THE SAME TIME THE SSPS WILL TRIP ALL FOUR BREAKERS THROUGH THE UNDERVOLTAGE COILS, PROVIDING A REDUNDANT REACTOR TRIP.
5. THE UNDERVOLTAGE COIL FOR EACH BYPASS BREAKER IS CONTROLLED FROM THE OPPOSITE TRAIN OF THE CONTROL CIRCUIT FOR THAT BREAKER.
6. BREAKER DISCONNECT PIN NUMBERS INSIDE A CIRCLE ARE ON A SPECIAL CONNECTOR MOUNTED INSIDE THE BREAKER COMPARTMENT.
7. CHANGE UNIT PREFIX FOR UNIT 2 UNID.
8. FOR TRIP PANEL CONNECTION SEE WESTINGHOUSE DWGS 5359C24,1726E57 & 6848D56 ON CONTRACT 85P60-837163.
9. THE "52X" CONTROL RELAY CONTACTS ARE MOMENTARY. BREAKER CLOSURE RE-OPENS THESE CONTACTS. REFER TO VENDOR MANUAL VTM-W120-0330/VTD-W120-7526 FOR ADDITIONAL CONTROL RELAY INFORMATION.

REFERENCE DRAWINGS:
- 47W611-99-1 --- REACTOR PROTECTION SYS LOGIC DIAG
- 45B640 -------- SWITCH DEVELOPMENT
- 1096E55 ------- W ELEMENTARY DIAGRAM
- 6848D55 ------- W SCHEMATIC DIAGRAM

SYMBOLS:
- * ---- DEVICE LOCATED IN MAIN CONTROL ROOM
- + ---- DEVICE LOCATED IN REACTOR TRIP SWITCHGEAR

pull

REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
9	DCN D21843	DGR	DMS	JKW	5-31-08
INC: DCA-D21843-25 R0 AND -26 R0					

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE CATEGORY 1

UNITS 1 & 2

WIRING DIAGRAMS
REACTOR PROTECTION SYSTEM
SCHEMATIC DIAGRAMS SH. 1

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: J.E.AVITT	CHECKER: D.T.KIRK	R0 ISSUE PER: CCD RECONCILIATION SHEET NO.CCD-8128. DRAWING MADE A CCD FROM AC-J & AD-R6. INC. WP M01143-06, DCN M01443A, DCA M01443-48 R0, -49 R0, -50 R0, -51 R0, -52 R0.	1 DANIEL T KIRK
DESIGNER: N/A	REVIEWER: K.R.SPINO		2 GEORGE R BELL
			3 M.R.SEDLACIK/KRS

ISSUED BY: P.G.TRUDEL	DATE 05-20-90	45	E	CCD NO: 1,2-45N699-1	R9

CAD MAINTAINED DRAWING

CONTROL ROOM DWG

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** REACTOR PROTECTION & ENGINEERED SAFETY FEATURES ACTUATION SYSTEMS

IV. **LENGTH OF LESSON:** 9 hour lecture; 4 hour simulator demonstration; 8 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Reactor Protection & Engineered Safety Features Actuation Systems in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with the Reactor Protection & Engineered Safety Features Actuation Systems as identified in Appendix A.
1. State the purpose/functions of the Reactor Protection & Engineered Safety Features Actuation Systems as described in the SQN FSAR.
2. State the design basis of the Reactor Protection & Engineered Safety Features Actuation Systems in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the Reactor Protection & Engineered Safety Features Actuation Systems as illustrated on a simplified system drawing.
4. Describe the following characteristics of each major component in the Reactor Protection & Engineered Safety Features Actuation Systems:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the components are designed
   m. Location of controls and indications in the control room and auxiliary control room

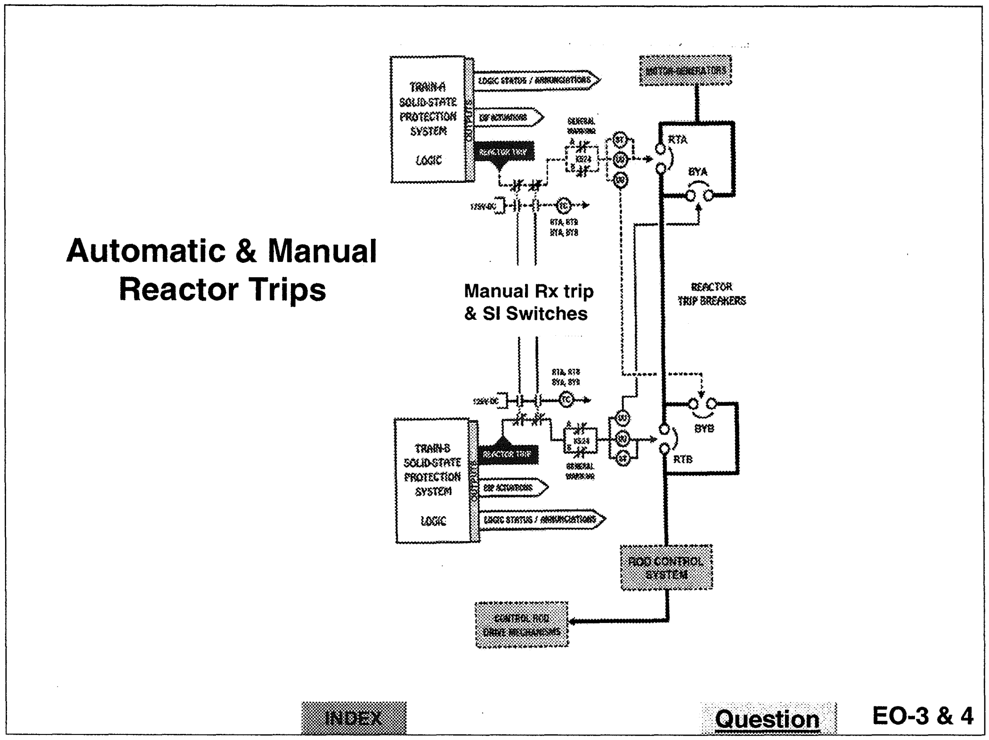
V. **TRAINING OBJECTIVES (Cont'd):**

B. Enabling Objectives (Cont'd):

5. Describe the operation of the Reactor Protection & Engineered Safety Features Actuation Systems:
   a. Precautions and limitations
   b. Major steps performed while placing the system in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect system operation
   f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the Reactor Protection & Engineered Safety Features Actuation Systems:
   a. State Tech Specs/TRM LCOs that govern the system.
   b. State the $\leq$1 hour action limit TS LCOs
   c. Given the conditions/status of the system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events

VI. **TRAINING AIDS:**

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)



X. LESSON BODY

D. Major Components

1. Solid State Protection System

Design Characteristics – Automatic Reactor trips *(Print 45N699-1)*

- **UV Trip – deenergize to trip – trip & bypass breakers** - Reactor trips are accomplished by de-energizing the 48vdc UV relay (power to breaker UV coils) for the reactor trip breakers (RTA and RTB) and the opposite trains bypass breakers (BYA and BYB), and
- **Shunt trip - energize to trip – normal TC** - By energizing the normal reactor trip breaker trip coil (52/TC) from a contact of the shunt trip relay. ***NOTE: This is for the reactor trip breaker only – the bypass breaker shunt trip functions only on a manual reactor or SI trip.***
- This causes loss of coil voltage to the control-rod-drive mechanisms, thereby dropping the control rods into the reactor core
- Manual trip of the trip and bypass breakers occurs via contacts in the breaker circuit independent of the SSPS

38. 013 G2.4.46 038

Given the following:

- Unit 2 was in Mode 3 performing Shutdown Bank withdrawal.
- Three (3) minutes ago, Safety Injection actuated when a Pressurizer PORV inadvertently opened before the PORV block valve was closed.
- Both reactor trip breakers failed to OPEN.
- The reactor was tripped locally by opening the M-G set motor supply breakers per FR-S.1, Response to Nuclear Power Generation/ATWS.
- Pressurizer pressure is currently 1940 psig.
- Bypass and Permissive Panel annunciators are as follows:
  - D-4 S.I. ACTUATED is LIT.
  - C-4 AUTO S.I. BLOCKED is DARK.

If the SI Reset push buttons were depressed, which ONE of the following represents the correct annunciator status and associated reason following the reset of Safety Injection for the above conditions?

A. SI ACTUATED will remain LIT because P-11 Permissive has NOT been met.

B. SI ACTUATED will remain LIT because Pressurizer pressure is less than the SI setpoint.

C. AUTO SI BLOCKED will remain DARK because the SI timing relay has NOT timed OUT.

D✓ AUTO SI BLOCKED will remain DARK because the P-4 Permissive has NOT been met.

DISTRACTOR ANALYSIS:

A. *Incorrect, the S.I. ACTUATED annunciator would be DARK after the resetting because the pressure is above the SI initiating setpoint. Plausible the pressure is below the P-11 set point (1970 psig) and P-11 is the setpoint above which a blocked SI signal will auto unblock.*

B. *Incorrect, the S.I. ACTUATED annunciator would be DARK after the resetting because the pressure is above the initiating setpoint. Plausible because if the pressurizer had been less than the SI setpoint of 1870 psig, then the annunciator would remain LIT after the reset was performed due to the auto block not being present.*

C. *Incorrect, the AUTO S.I. BLOCKED annunciator would be DARK however it is not because of the SI timing relay. Plausible because the relay will prevent any reset function until it times out after 60 seconds. However, the timer would have already timed out.*

D. *CORRECT, the AUTO S.I. BLOCKED annunciator would be DARK with the reactor tripped from the MG set supply breakers because the P-4 inputs to the SI reset circuit are not present and the auto SI cannot be blocked. The SI can be reset and equipment removed however the SI would be reinitiated automatically if conditions were again met. Once the Rx Trip breakers are opened, the auto SI could be blocked. Then cycling the breakers would automatically defeat the blocking circuit and arm the SI automatic initiating circuits.*

Question No. 38

Tier 2 Group 1

K/A 013 G2.4.46
Engineered Safety Features Actuation System (ESFAS)
Ability to verify that the alarms are consistent with the plant conditions.

Importance Rating: 4.2 / 4.2

Technical Reference: 1- 47W611-63-1 R3
1-AR-M4-A, Bypasses and Permissives 1-XA-M-4A, Rev 13

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.RPS B.5.e
Describe the operation of the Reactor Protection &
Engineered Safety Features Actuation Systems:
e. How a support system failure will effect system operation.

Question Source:
Bank # __________
Modified Bank # __X_______
New ________

Question History: North Anna 2006 RO exam Question 013A4.02 001 modified.

Question Cognitive Level:
Memory or fundamental knowledge ________
Comprehension or Analysis _X_____

10 CFR Part 55 Content: (CFR: 41.10 / 43.5 / 45.3 / 45.12)

10CFR55.43.b (n/a)

Comments: Modified Question 013A4.02 001 from North Anna 2006 RO exam.

S.I. ACTUATED

Source	Setpoint
SER 1925 1. Manual 1-HS-63-133A or 133B actuated. 2. Pressurizer pressure < 1870 psig PS-68-340D, 334D, 323D. 3. High containment pressure >1.54 psig PS-30-44B, 43B, 42B. 4. Low Steamline pressure (600 psig) Loop 1 PS-1-2AN 2BN, 5A Loop 2 PS-1-9AN, 9BN, 12A Loop 3 PS-1-20AN, 20BN, 23A Loop 4 PS-1-27AN, 27BN, 30A	1. Manual 2. Pressurizer pressure ≤ 1870 psig. 3. High containment pressure of 1.54 psig. 4. Low steamline pressure of 600 psig.

Probable Causes

1. Main steamline rupture.
2. Loss of coolant accident.
3. Operator action.

Corrective Actions

[1] GO TO E-0, *Reactor Trip or Safety Injection.*

References

45B655-04A-0,
47W611-63-1,

Source	Setpoint	
SER 1918 HS-63-134A and HS-63-134B depressed **OR** Auto SI block jumper installed.	N/A	**AUTO S.I. BLOCKED**

NOTE 1: This annunciator light will clear if the Rx trip breakers have been cycled. Cycling the trip breakers will re-enable SI and clear the alarm.

NOTE: 2 If the AUTO SI block jumpers are installed, the alarm will clear after the Rx trip breakers are cycled.

Probable Causes

1. SI has been reset by operator action.
2. Auto SI block jumper installed in accordance with 0-PI-IXX-099-002.0.

Corrective Actions

[1] **IF** jumper installed, **THEN** **VERIFY** 0-PI-IXX-099-002.0, *Auto SI Block,* in progress.

NOTE

This annunciator window illumination indicates that the auto safety injection actuation is blocked and also allows SI Actuated annunciation (D-4) to reset.

[2] **FOLLOW** appropriate Emergency Instructions for SI-reset and recovery.

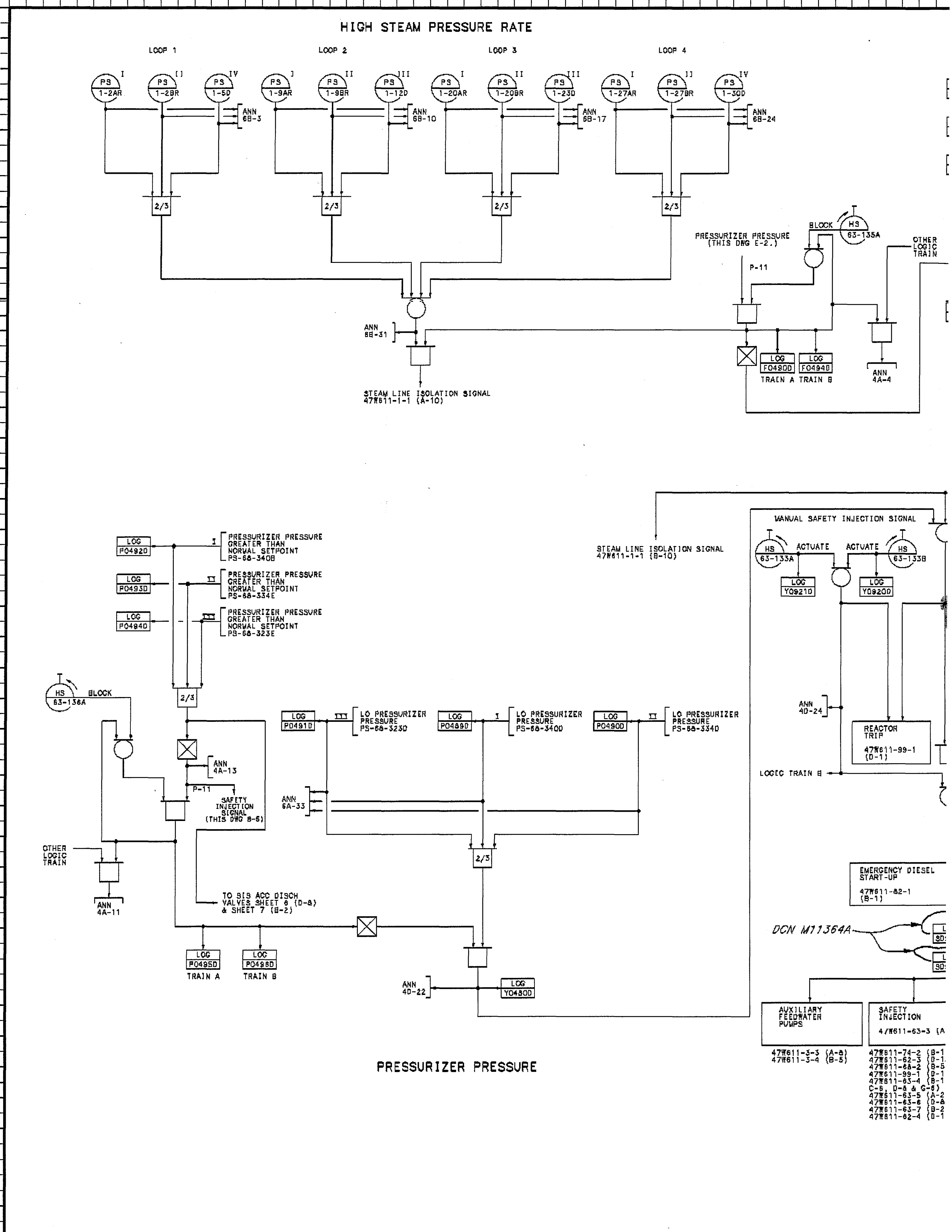
References

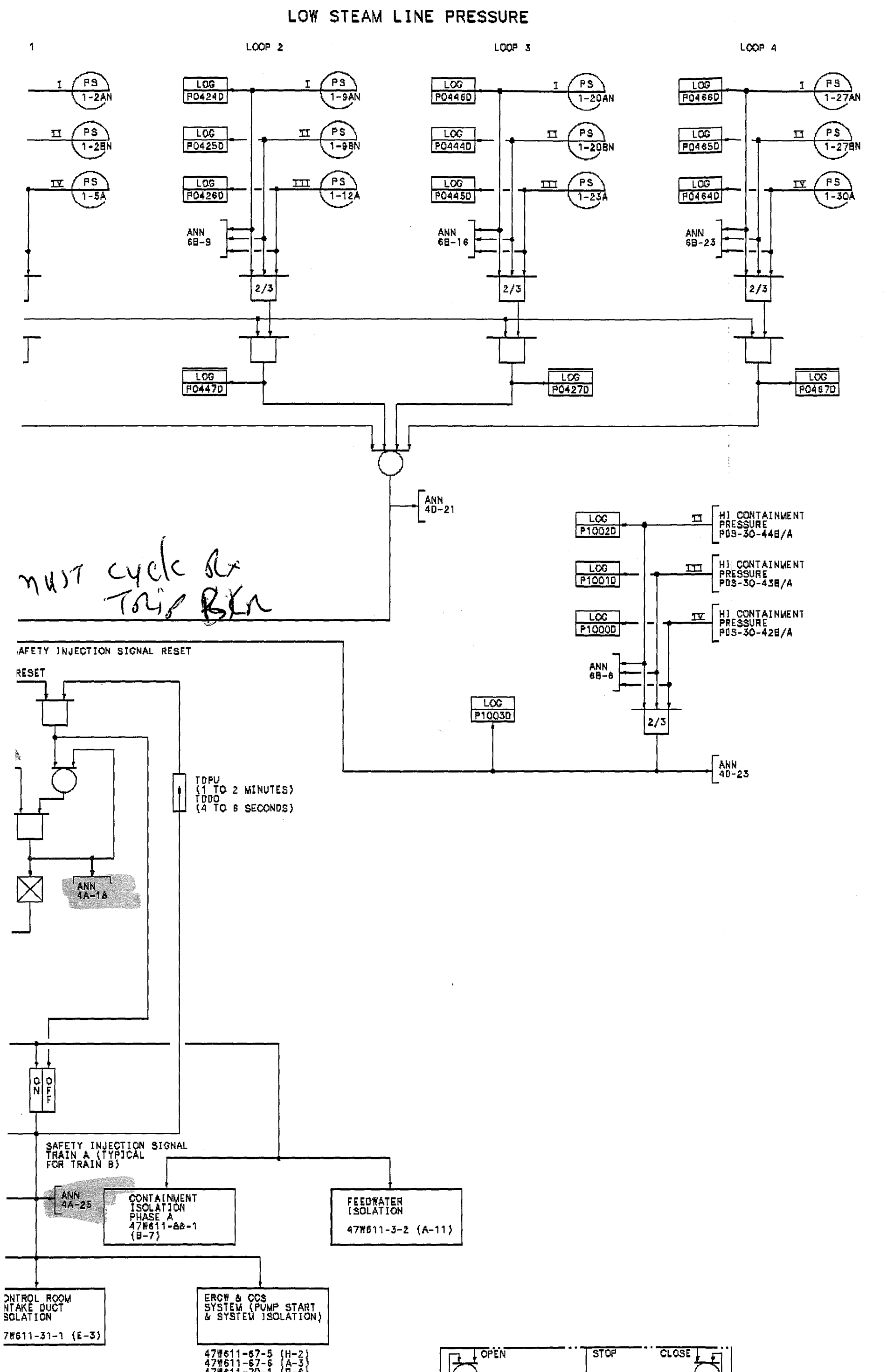
45B655-04A-0,
47W611-99-1

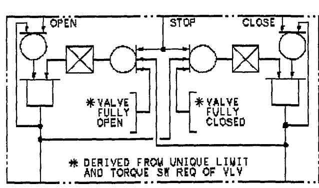
BYPASS AND PERMISSIVE
1-XA-55-4A

	1	2	3	4	5	6	7	
A	SOURCE RANGE TRIP BYPASS CHANNEL 1 1	INTERMEDIATE RANGE TRIP BYPASS CHANNEL 1 2	NC-41L NUC OVERPOWER ROD STOP BYPASS 3	STEAMLINE PRESS ISOL/SI BLOCK RATE ISOL ENABLE 4	STEAM DUMP INTERLOCK TRAIN A BYPASS 5	STEAM DUMP INTERLOCK TRAIN B BYPASS 6	PROTECTION SET 1 BYPASS 7	A
B	SOURCE RANGE TRIP BYPASS CHANNEL II 8	INTERMEDIATE RANGE TRIP BYPASS CHANNEL II 9	NC-42L NUC OVERPOWER ROD STOP BYPASS 10	PRESSURIZER SI TRAINS A & B BLOCKED 11	P-7 LOW POWER TRIP BLOCK 12	P-11 PRESSURIZER SI PERMISSIVE 13	PROTECTION SET II BYPASS 14	B
C	SOURCE RANGE TRAINS A & B TRIP BLOCK 15	INTERMED RANGE TRAINS A & B TRIP BLOCKED 16	NC-43L NUC OVERPOWER ROD STOP BYPASS 17	AUTO S.I. BLOCKED 18	P-8 LOW POWER LOW FLOW TRIP BLOCKED 19	P-12 LO-LO T AVG SI STEAM DUMP INTERLOCK 20	PROTECTION SET III BYPASS 21	C
D	POWER RANGE LOW SETPOINT TRAINS A & B TRIP BLOCKED 22	P-6 INTERMEDIATE RANGE PERMISSIVE 23	NC-44L NUC OVERPOWER ROD STOP BYPASS 24	S.I. ACTUATED 25	P-10 NUCLEAR AT POWER PERMISSIVE 26	P-13 LO TRUBINE IMPULSE PRESS PERMISSIVE 27	PROTECTION SET IV BYPASS 28	D
E	C-3 OVERTEMP ΔT ROD STOP AND TURB RUNBACK 29	C-4 OVERPOWER ΔT ROD STOP AND TURB RUNBACK 30	C-5 LOW TURB IMPULSE PRESS ROD WITHDRAWAL BLOCKED 31	P-9 LOW POWER TURB TRIP-REAC TRIP BLOCK 32	C-7 LOSS OF LOAD INTERLOCK 33	C-9 CONDENSER INTERLOCK 34	C-20 AMSAC ARMED 35	E
	1	2	3	4	5	6	7	

2-47W611-63-1 M 45







TYPICAL MOV CONTROL

NOTES:

1. FOR SYMBOLS OTHER THAN THOSE NOTED BELOW SEE INSTRUMENTATION AND IDENTIFICATION STANDARDS, LATEST ISSUE.
2. FOR COMPLETE INSTRUMENTATION AND COMPONENT SEPARATION DESIGNATIONS SEE CONTROL DIAGRAM 47W610-63-1 & 2.
3.
4. P1 = PRESSURE IN LOOP 1
   P2 = PRESSURE IN LOOP 2
   P3 = PRESSURE IN LOOP 3
   P4 = PRESSURE IN LOOP 4
5. PROTECTION SET CHANNEL DESIGNATIONS ARE ROMAN NUMERALS I, II, III & IV.
6. ANNUNCIATOR POINTS ON LOGIC DIAGRAMS ARE INDICATED BY GIVING THE ANNUNCIATOR PANEL NUMBER AND THE WINDOW NUMBER AS GIVEN ON TVA DRAWINGS 47B601-55-0 THRU 65.
7. DIGITAL AND ANALOG LOGIC SYMBOLS ARE USED ON LOGIC DIAGRAMS TO FUNCTIONALLY DESCRIBE THE PROCESS CONTROL REFER TO THE ASSOCIATED WIRING SCHEMATIC FOR THE ELECTRICAL COMPONENTS USED TO IMPLEMENT THE CONTROL SCHEME.

NOTES CONTINUED ON SHEETS 2 THRU 8

SYMBOLS:

*- LOCATED ON ELECTRICAL SWITCHGEAR.
#- LOCATED IN AUXILIARY CONTROL ROOM.
▲- TEST SWITCH.
△- LOCAL CONTROL SWITCH.

REFERENCE DRAWINGS:

LOGIC INDEX
47W611-0-1 & 2

MECHANICAL LOGIC DIAGRAMS
47W611-62-4
47W611-63-3 THRU 7
47W611-67-1,5 & 7
47W611-68-3
47W611-72-1
47W611-74-2
47W611-78-1
47W611-99-1

MECHANICAL CONTROL DIAGRAMS
47W610-1-1,2
47W610-30-1
47W610-63-1 & 2
47W610-68-1 THRU 6

NON-INTENT

WESTINGHOUSE FUNCTIONAL DIAGRAMS
5655D28 SERIES
1082H70 SERIES

COMPANION DRAWINGS
47W611-63-2 THRU 8

FOR ORIGINAL SIGNATURES IN TITLE BLOCK SEE REVISION 0 MICROFILM COPY.

pull

	NON-INTENT					
3	DCN M11384A	N/A	HRF			
INC: DCA M11384-102 R0 INC: NON-INTENT CHANGE TO REMOVE I-TAB REFERENCE DWG.						
REV	ECN/DCN	CHG DOC	DRWN	CHKD	APPD	DATE

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE
UNIT 2
CATEGORY 1

MECHANICAL LOGIC DIAGRAM SAFETY INJECTION SYSTEM

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
NUCLEAR ENGINEERING
Q

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: JOHN AVITT	CHECKER: E.MATTHEWS	R0 ISSUE PER: CCD REC SHEET NO. 7097. DRAWING MADE A CCD FROM 1,2-47W611-63-1 R3.	1 W.G.SEXTON
DESIGNER: N/A	REVIEWER: P.A.LUNN		2 M.R.SEDLACIK/LWA
			3 E.H.TURNER

ISSUED BY: R.A.WITTHAUER

DATE				
5-19-89	45	M	CCD NO: 2-47W611-63-1	R3

CONTROL ROOM DWG

013A4.02 001

Given the following plant conditions:

- Two minutes ago, an MSTV inadvertently closed causing secondary safeties to lift and a reactor trip and safety injection due to high steam flow coincident with low steamline pressure.
- The reactor trip breakers failed to open.
- Operators tripped the reactor locally from 307 switchgear by tripping both M-G Set Motor Supply Breakers per FR-S.1, Attachment 4, "Response to Nuclear Power Generation/ATWS, Remote Reactor Trip."
- It is now desired to reset SI and secure SI equipment.
- RCS pressure is 1950 psig.

Which ONE of the following represents why an automatic SI will not be blocked following a reset from the Main Control Board under the above conditions?

A. RCS pressure is less than the SI setpoint.

B.✓ Permissive P-4 has not actuated.

C. Permissive P-11 has actuated.

D. The SI timing relays.

DISTRACTOR ANALYSIS:

A INCORRECT P-11 (2000 psig) is the set point above which a blocked SI signal will auto unblock.

B CORRECT The block remains in effect until the reactor trip breakers are reset. Resetting the reactor trip breakers automatically defeats the blocking circuit and arms the SI automatic initiating circuits.

C INCORRECT Pressurizer pressure below the SI setpoint will initiate an SI signal but will not prevent resetting SI.

D INCORRECT SI will not reset if the 60 second timer is active. However, the timer timed out 60 seconds ago.

REFERENCES:
1. NCRODP-77-NA, "Reactor Protection Systems," pages 24, 25, 46, A-3, 50, 51, T-12, T-13, figures 77-4 & 77-12.
2. FR-S.1, Attachment 4, "Response to Nuclear Power Generation/ATWS, Remote Reactor Trip," Steps 1 & 3.

K/A CATALOGUE QUESTION DESCRIPTION:
- Engineered Safety Features Actuation System (ESFAS); Ability to manually operate and/or monitor in the control room: Reset of ESFAS channels.

K/A MATCH:
- This question matches the K/A in that the operator must be albe to determine from plant indications (monitor) whether or not ESFAS channels will be able to be reset (ability).

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** REACTOR PROTECTION & ENGINEERED SAFETY FEATURES ACTUATION SYSTEMS

IV. **LENGTH OF LESSON:** 9 hour lecture; 4 hour simulator demonstration; 8 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Reactor Protection & Engineered Safety Features Actuation Systems in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with the Reactor Protection & Engineered Safety Features Actuation Systems as identified in Appendix A.
1. State the purpose/functions of the Reactor Protection & Engineered Safety Features Actuation Systems as described in the SQN FSAR.
2. State the design basis of the Reactor Protection & Engineered Safety Features Actuation Systems in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the Reactor Protection & Engineered Safety Features Actuation Systems as illustrated on a simplified system drawing.
4. Describe the following characteristics of each major component in the Reactor Protection & Engineered Safety Features Actuation Systems:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the components are designed
   m. Location of controls and indications in the control room and auxiliary control room

V. TRAINING OBJECTIVES (Cont'd):

B. Enabling Objectives (Cont'd):

5. Describe the operation of the Reactor Protection & Engineered Safety Features Actuation Systems:
   a. Precautions and limitations
   b. Major steps performed while placing the system in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect system operation
   f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the Reactor Protection & Engineered Safety Features Actuation Systems:
   a. State Tech Specs/TRM LCOs that govern the system.
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events

VI. TRAINING AIDS:

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)

39. 022 K4.03 039

Which ONE of the following Containment Cooling System fans will trip and isolate as a **DIRECT** result of a manual Containment Isolation Phase-A Signal?

A. Lower Compartment Coolers

B. Upper Compartment Coolers

C. Control Rod Drive Motor coolers

D✓ Incore Instrument Room coolers

DISTRACTOR ANALYSIS:

All 4 of the choices are containment coolers that are tripped by one of the containment isolation signals.

A. Incorrect, These coolers are tripped for a phase B signal, the examinee could mistake these as being tripped by a Phase A isolation signal. Plausible because the Lower Compartment Cooler fans do get a signal to trip from a containment isolation signal, (Phase B, not Phase A)

B. Incorrect, These coolers are tripped for a phase B signal, the examinee could mistake these as being tripped by a Phase A isolation signal. Plausible because the Upper Compartment Cooler fans do get a signal to trip from a containment isolation signal, (Phase B, not Phase A)

C. Incorrect, These coolers are tripped for a phase B signal, the examinee could mistake these as being tripped by a Phase A isolation signal. Plausible because the CRDM Cooler fans do get a signal to trip from a containment isolation signal, (Phase B, not Phase A)

D. CORRECT, This cooler is tripped by a Phase A signal.

Question No. 40

Tier 2 Group 2

K/A 022 K4.03
Knowledge of CCS design feature(s) and/or interlock(s) which provide for the following: Automatic containment isolation

Importance Rating: 3.6 / 4.0

Technical Reference: 1,2-47W611-30-2 R2
1,2-47W611-30-3 R6
1,2-47W611-30-4 R18

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.CONTCOOLING B.4.e & g
Describe the following items for each major component in the containment cooling system.
e. Component operation
g. interlocks (including setpoints)

Question Source:
Bank # __X_______
Modified Bank # _________
New _______

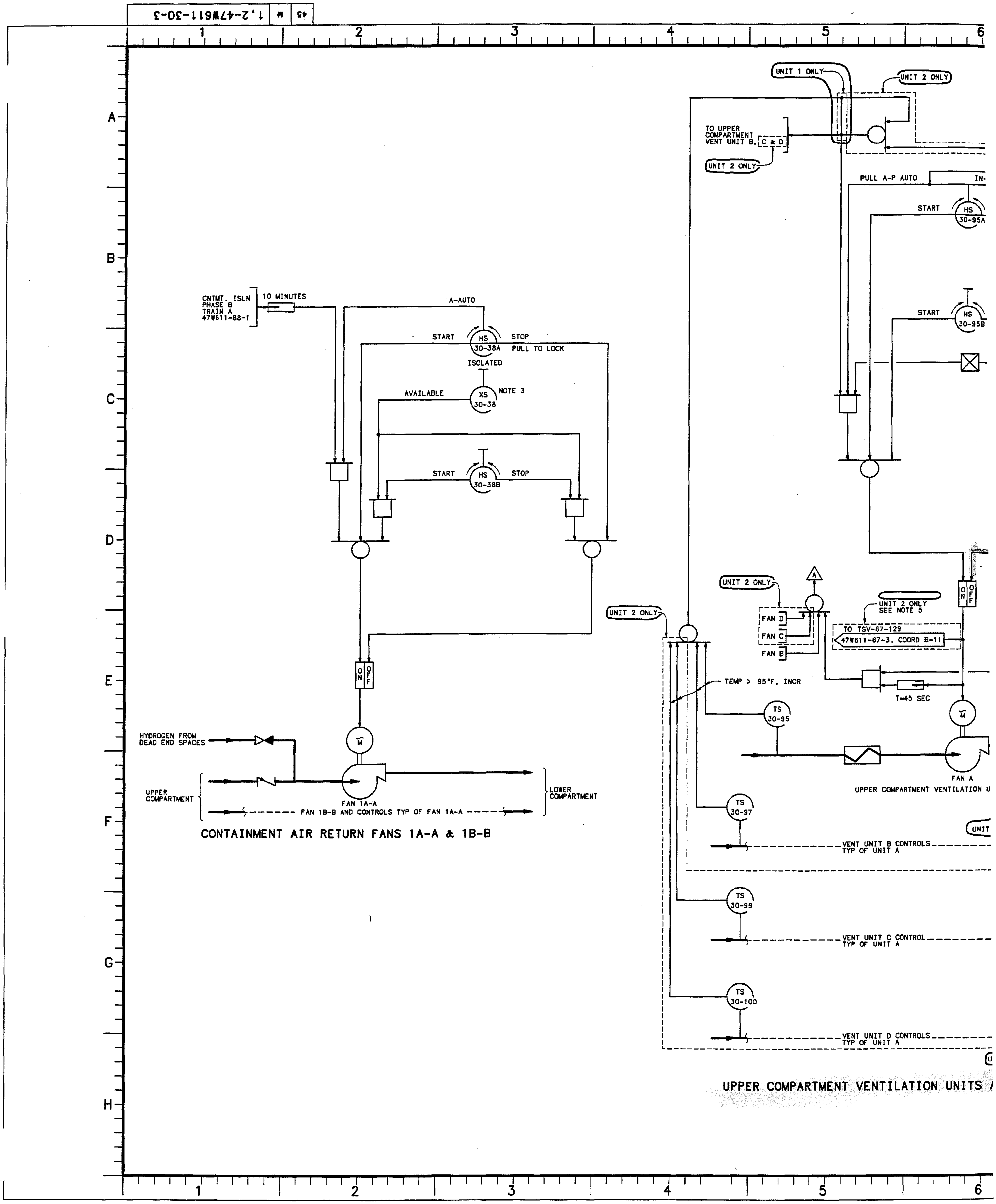
Question History: WBN Bank SYS030C.05 002

Question Cognitive Level:
Memory or fundamental knowledge __X_______
Comprehension or Analysis _________

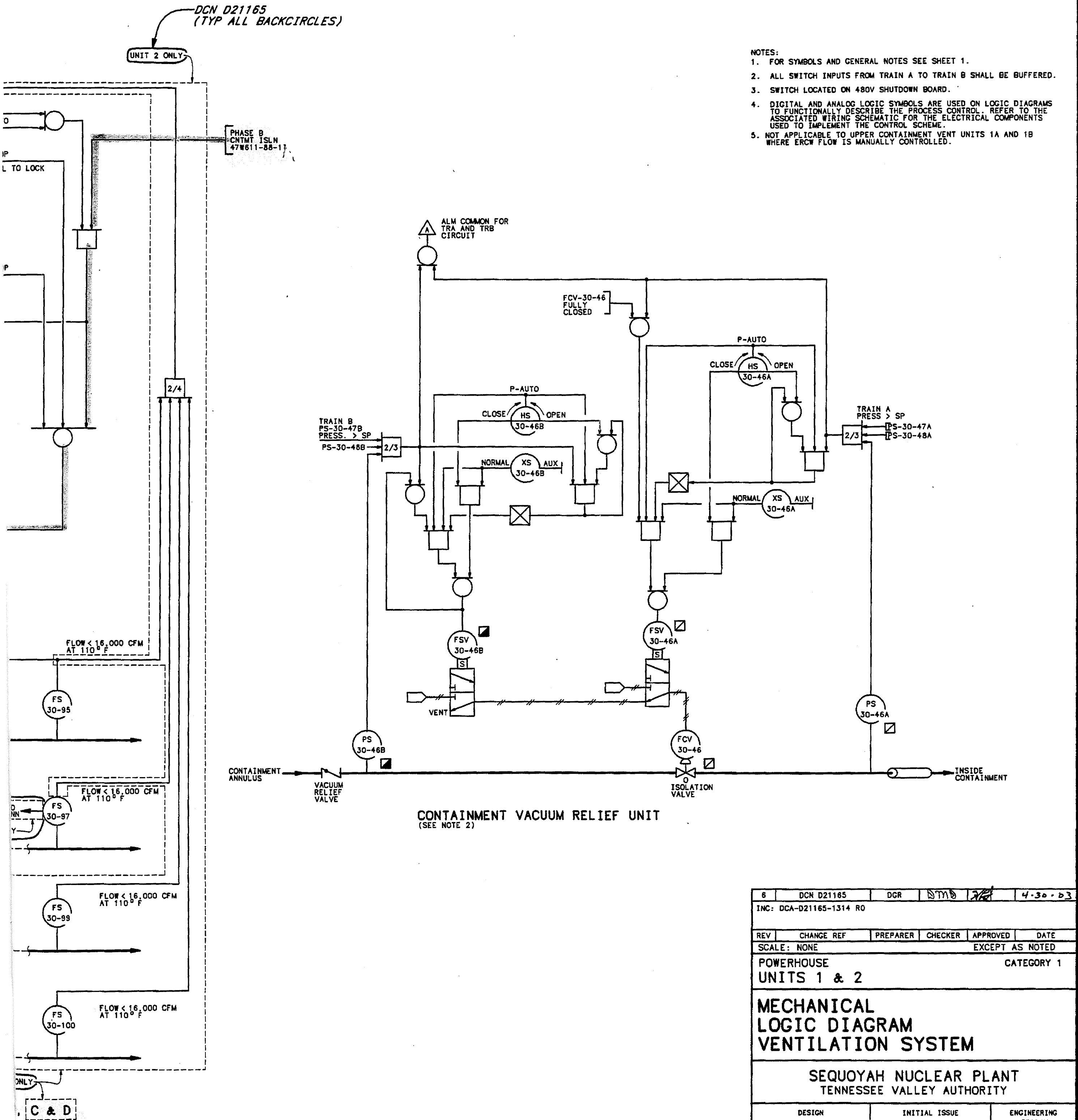
10 CFR Part 55 Content: 41.7

10CFR55.43.b (n/a)

Comments: WBN Bank SYS030C.05 002


45 M 1,2-47W611-30-3
UNIT 1 ONLY
UNIT 2 ONLY
TO UPPER COMPARTMENT VENT UNIT B, C & D
PULL A-P AUTO
START
HS 30-95A
HS 30-95B
CNTMT. ISLN PHASE B TRAIN A 47W611-88-1
10 MINUTES
A-AUTO
START
STOP
PULL TO LOCK
HS 30-38A
ISOLATED
AVAILABLE
XS 30-38
NOTE 3
HS 30-38B
ON OFF
FAN D
FAN C
FAN B
UNIT 2 ONLY SEE NOTE 5
TO TSV-67-129 47W611-67-3, COORD B-11
TEMP > 95°F, INCR
T=45 SEC
TS 30-95
TS 30-97
TS 30-99
TS 30-100
HYDROGEN FROM DEAD END SPACES
UPPER COMPARTMENT
FAN 1A-A
FAN 1B-B AND CONTROLS TYP OF FAN 1A-A
LOWER COMPARTMENT
CONTAINMENT AIR RETURN FANS 1A-A & 1B-B
FAN A
UPPER COMPARTMENT VENTILATION U
VENT UNIT B CONTROLS TYP OF UNIT A
VENT UNIT C CONTROL TYP OF UNIT A
VENT UNIT D CONTROLS TYP OF UNIT A
UPPER COMPARTMENT VENTILATION UNITS

NOTES:
1. FOR SYMBOLS AND GENERAL NOTES SEE SHEET 1.
2. ALL SWITCH INPUTS FROM TRAIN A TO TRAIN B SHALL BE BUFFERED.
3. SWITCH LOCATED ON 480V SHUTDOWN BOARD.
4. DIGITAL AND ANALOG LOGIC SYMBOLS ARE USED ON LOGIC DIAGRAMS TO FUNCTIONALLY DESCRIBE THE PROCESS CONTROL. REFER TO THE ASSOCIATED WIRING SCHEMATIC FOR THE ELECTRICAL COMPONENTS USED TO IMPLEMENT THE CONTROL SCHEME.
5. NOT APPLICABLE TO UPPER CONTAINMENT VENT UNITS 1A AND 1B WHERE ERCW FLOW IS MANUALLY CONTROLLED.



CONTAINMENT VACUUM RELIEF UNIT
(SEE NOTE 2)

REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
6	DCN D21165	DGR	DMB	[illegible]	4-30-03
INC: DCA-D21165-1314 R0					

SCALE: NONE — EXCEPT AS NOTED

POWERHOUSE
UNITS 1 & 2 — CATEGORY 1

MECHANICAL LOGIC DIAGRAM VENTILATION SYSTEM

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY

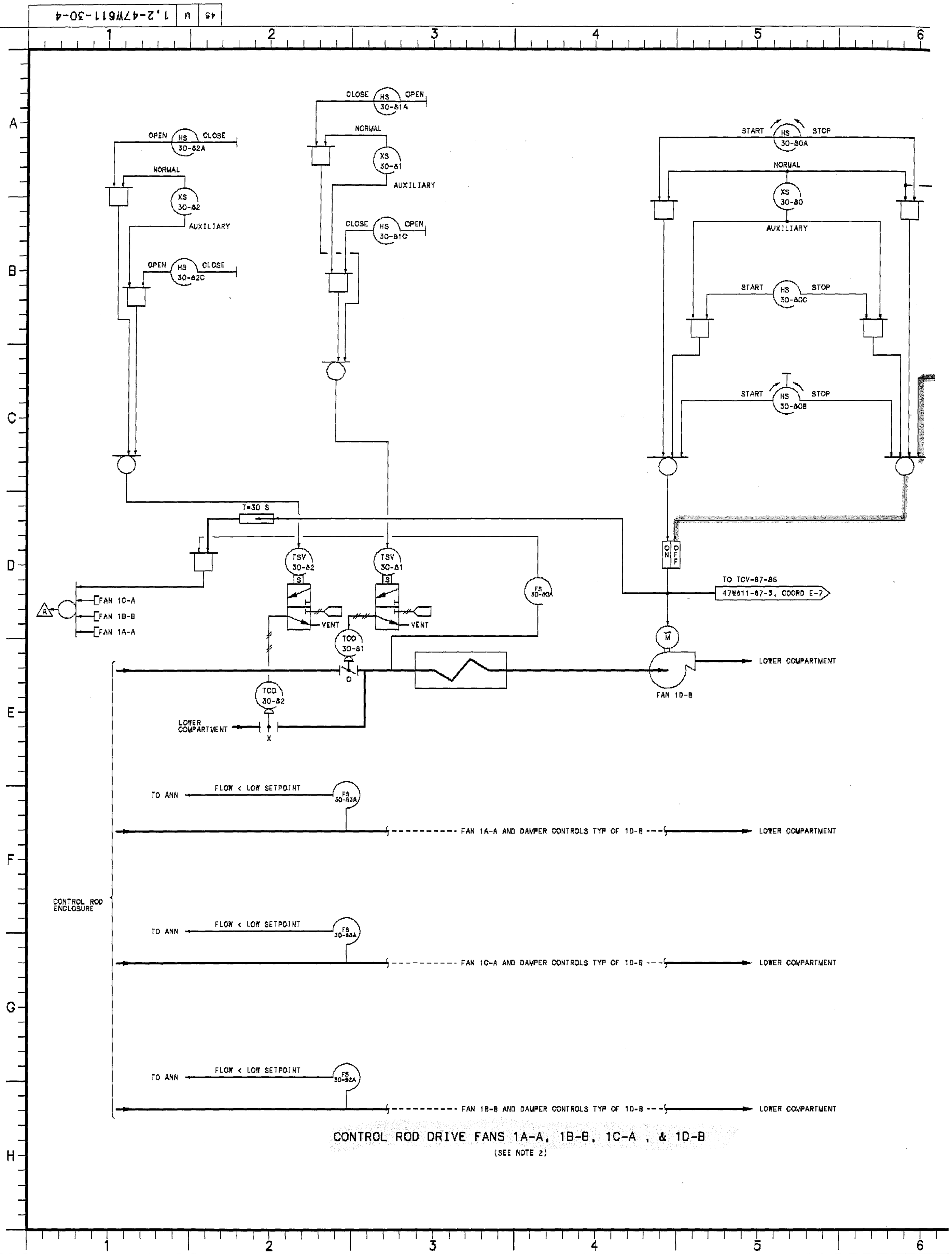
DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: D.G.ROOP	CHECKER: G.G.MAILEN	R0 ISSUE PER: DRAWING MADE A CCD FROM AC-N/A & AD-R14. ALSO MADE CAT 1 PER AI-25, (PART 1), APPENDIX 1 AND RIMS B37 911119 805.	1 N/A
DESIGNER: N/A	REVIEWER: N/A		2 G.G.MAILEN
			3 M.R.SEDLACIK/LWA

ISSUED BY: N/A

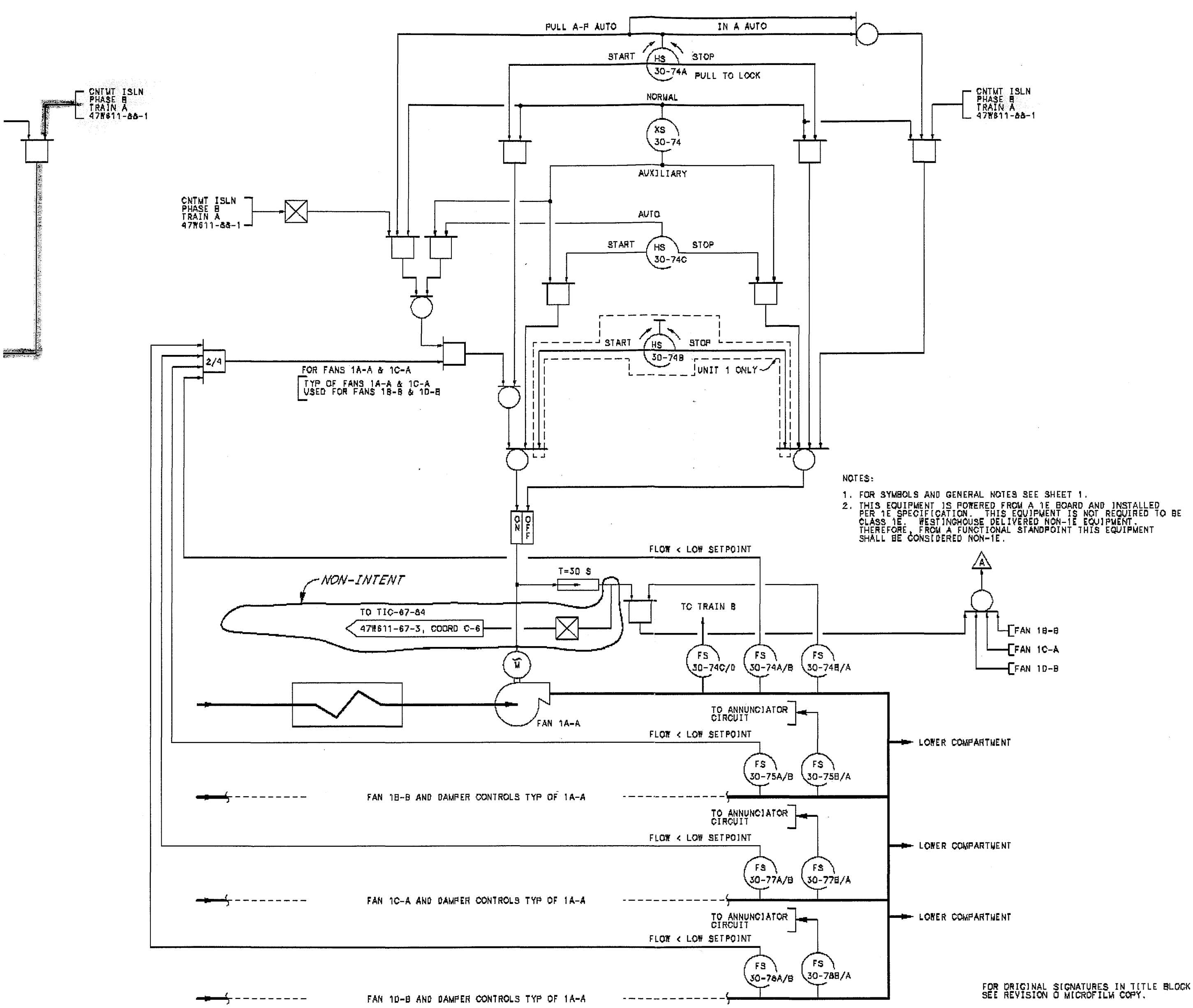
DATE 01-03-92 | 45 | M | CCD NO:1,2-47W611-30-3 R6

CAD MAINTAINED DRAWING

CONTROL ROOM DWG



CONTROL ROD DRIVE FANS 1A-A, 1B-B, 1C-A , & 1D-B
(SEE NOTE 2)



NOTES:

1. FOR SYMBOLS AND GENERAL NOTES SEE SHEET 1.
2. THIS EQUIPMENT IS POWERED FROM A 1E BOARD AND INSTALLED PER 1E SPECIFICATION. THIS EQUIPMENT IS NOT REQUIRED TO BE CLASS 1E. WESTINGHOUSE DELIVERED NON-1E EQUIPMENT. THEREFORE, FROM A FUNCTIONAL STANDPOINT THIS EQUIPMENT SHALL BE CONSIDERED NON-1E.

FOR ORIGINAL SIGNATURES IN TITLE BLOCK SEE REVISION 0 MICROFILM COPY.

LOWER COMPARTMENT COOLING FANS 1A-A, 1B-B, 1C-A, & 1D-B

REV	ECN/DCN	CHG DOC	DRWN	CHKD	APPD	DATE
18	NON-INTENT	N/A	JLD			
INC: NON-INTENT CHANGE (REF RIMS B37 960513 001).						

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE
UNITS 1 & 2
CATEGORY 1

MECHANICAL LOGIC DIAGRAM VENTILATION SYSTEM

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
NUCLEAR ENGINEERING
Q

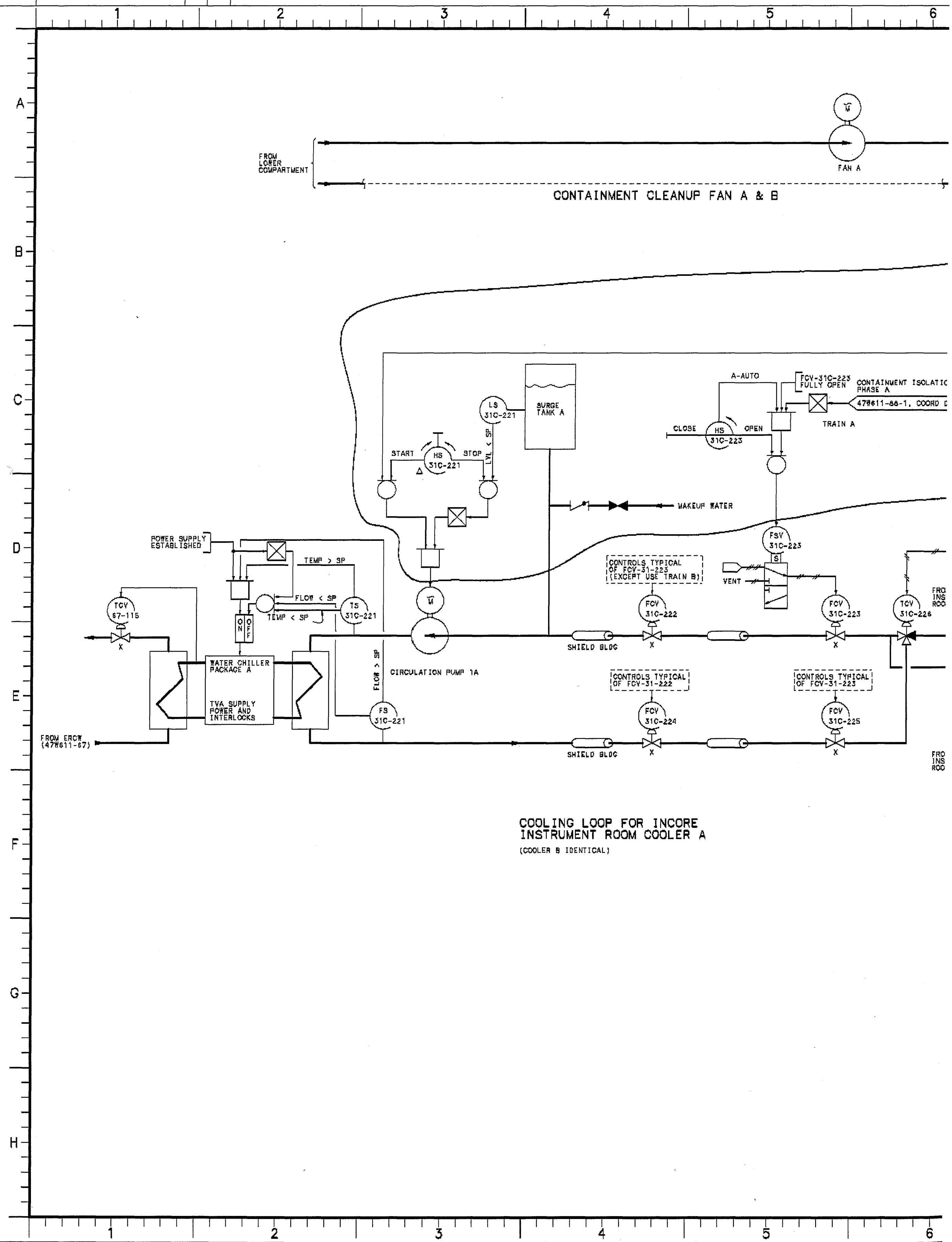
DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: Dave Park	CHECKER: P.S. JACKSON	RO ISSUE PER: CCD RECONCILIATION SHEET NO.CCD-3843. DWG MADE A CCD FROM AC-E(U1), AC-H(U2) & AD-R14. INC EP 12827 & DCN X00040A.	1 C.A.BADGETT
DESIGNER: N/A	REVIEWER: M.F.SCRUGGS		2 L.W.ACKLEY FOR M.R.SEDLACIK
			3 JOE A.DUCK
DATE 9-9-88	45 M	CCD NO: 1,2-47W611-30-4 R18	

ISSUED BY: P.TRUDEL/JDC

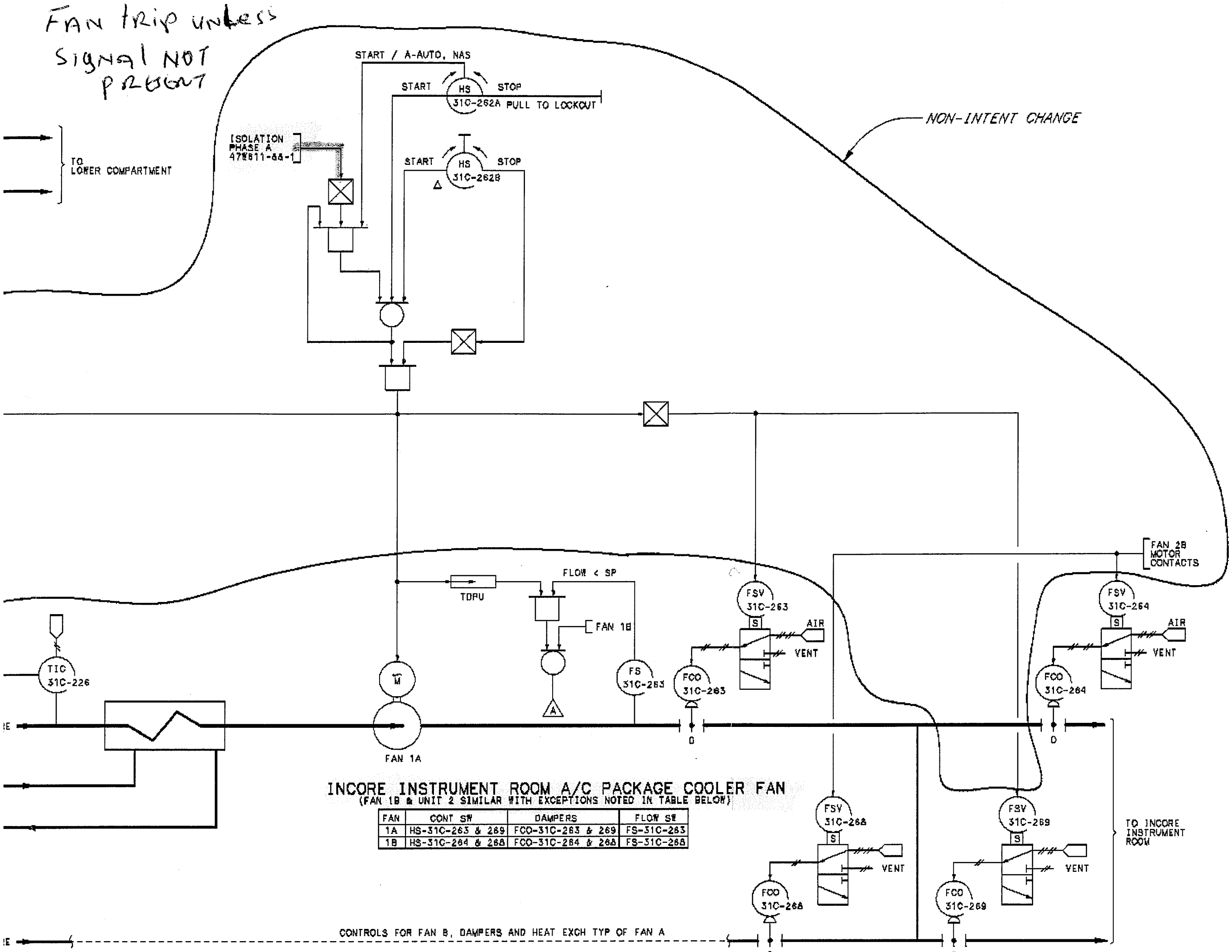
DRAWING SERVICES UNIT
CAD MAINTAINED DRAWING
THIS CONFIGURATION CONTROL DRAWING IS MAINTAINED BY THE SQN CAD UNIT AND IS NOW PART OF THE TVA CADAM DATABASE.
COMPUTER GRAPHICS

CONTROL ROOM DWG

1,2-47W611-30-2 M 45



Fan trip unless
Signal NOT
PRESENT



INCORE INSTRUMENT ROOM A/C PACKAGE COOLER FAN
(FAN 1B & UNIT 2 SIMILAR WITH EXCEPTIONS NOTED IN TABLE BELOW)

FAN	CONT SW	DAMPERS	FLOW SW
1A	HS-31C-263 & 269	FCO-31C-263 & 269	FS-31C-263
1B	HS-31C-264 & 268	FCO-31C-264 & 268	FS-31C-268

INCORE INSTRUMENT ROOM COOLERS A & B

NOTE:
1. FOR NOTES & REFERENCES SEE 47W611-30-1.

FOR ORIGINAL SIGNATURES IN TITLE BLOCK SEE REVISION 0 MICROFILM COPY.

REV	ECN/DCN	CHG DOC	DRWN	CHKD	APPD	DATE
2	NON-INTENT	N/A	DGR			
REVISED PER NON-INTENT CHANGE TO SHOW CORRECT LOGIC.						

SCALE: NONE EXCEPT AS NOTED

POWERHOUSE
UNITS 1 & 2
CATEGORY 1

MECHANICAL LOGIC DIAGRAM VENTILATION SYSTEM

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF NUCLEAR ENGINEERING
Q

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: J.COLE	CHECKER: L.WALTERS	RO ISSUE PER: DRAWING MADE A CCD FROM AC-N/A & AD-R9	1 N/A 2 E.KURT
DESIGNER: N/A	REVIEWER: N/A		3 W.R.SEDLACIK/KRS

ISSUED BY: N/A
DATE 2-25-91 | 45 | M | CCD NO:1,2-47W611-30-2 R2

CAD MAINTAINED DRAWING
DNE-PROJECT SERVICES BRANCH
THIS CONFIGURATION CONTROL DRAWING IS MAINTAINED BY THE SQN CAD UNIT AND IS NOW PART OF THE TVA CADAM DATABASE.
COMPUTER GRAPHICS

CONTROL ROOM DWG

SYS030C.05 002

Which one of the following Containment Cooling System fans will trip as a DIRECT result of a ØA Containment Isolation signal?

a. Lower compartment coolers.

b. Upper compartment coolers.

c. CRDM cooler.

d.✔ Incore Instrument room cooler.

The correct answer is D

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** CONTAINMENT COOLING SYSTEM

IV. **LENGTH OF LESSON:** Initial License Training: 4.5 hour lecture; 1 hour simulator demonstration; 1 hour self-study/workshop

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:

Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Containment Cooling Systems in the plant and on the simulator.

B. Enabling Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated the containment cooling system that are rated $\geq$ 2.5 during Initial License training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the containment cooling system as described in the SQN FSAR.
2. State the design basis of the containment cooling system in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the containment cooling system.
4. Describe the following items for each major component in the containment cooling system.
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the containment cooling system components are designed
   m. Location of controls and indications associated with the containment cooling system in the control room and auxiliary control room

V. TRAINING OBJECTIVES (Cont'd):

B. Enabling Objectives (Cont'd):

5. Describe the operation of the containment cooling system as it relates to the following:
   a. Precautions and limitations
   b. Major steps performed while placing the containment cooling system in service
   c. Alarms and alarm response
   d. How a component failure will affect system operation
   e. How a support system failure will affect the containment cooling system operation
   f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the containment cooling system :
   a. State Tech Specs/TRM LCOs that govern the containment cooling system
   b. State the ≤1 hour action limit TS LCOs
   c. Given the conditions/status of the containment cooling system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events:
   a. Event Title: ORR03031: Inadequate Pre-Job Brief Results in Incorrect Procedure Application in Starting Lower Compartment Cooling Unit. *Ref: PER 03-009020-000*

VI. TRAINING AIDS:

A. Computer.
B. Computer Display Projector & Controls.
C. Local Area Network (LAN) Access.
D. Simulator (if available)

40. 025 K5.02 040

Which ONE of the following Ice Condenser temperatures is within the optimum range to minimize sublimation, frost buildup, and ice condenser door binding problems?

A.✓ 18°F

B. 21°F

C. 24°F

D. 27°F

<u>*DISTRACTOR ANALYSIS:*</u>

SO-61-1, Ice Condenser Cooling, Precaution and Limitation 'E' states "In order to minimize sublimation, frost buildup and ice condenser door binding problems, the Ice Condenser temp should be maintained within the optimum range of 18°F to 20°F. FSAR 6.5.7.2 identifies 19°F to be the optimum to minimize concrete expansion, floor heaving and frost buildup.

A. CORRECT, the 18°F temperature is within the optimum range of 18°F to 20°F identified in SO-61-1.

B. Incorrect, the 21°F temperature is not within the optimum range of 18°F to 20°F identified in SO-61-1. Plausible because value is a temperature within T/S limit for the Ice Bed temperature.

C. Incorrect, the 24°F temperature is not within the optimum range of 18°F to 20°F identified in SO-61-1. Plausible because value is a temperature within T/S limit for the Ice Bed temperature.

D. Incorrect, the 27°F temperature is not within the optimum range of 18°F to 20°F identified in SO-61-1. Plausible because value is a temperature within T/S limit for the Ice Bed temperature. It is the maximum temperature allowed without entering the action.

Question No. 40

Tier 2 Group 1

K/A 025 K5.02
Knowledge of operational implications of the following concepts as they apply to the ice condenser system: Heat transfer

Importance Rating: 2.6* / 2.8*

Technical Reference: SO-61-1, Ice Condenser Cooling, Rev 30
FSAR 6.5.7.2, Amendment 20

Proposed references to be provided to applicants during examination: None

Learning Objective: OPT200.ICE B.5.a
Describe the operation of the Ice Condenser System:
a. Precautions and Limitations

Question Source:
Bank # __________
Modified Bank # __________
New ___X____

Question History: New for SQN Exam 1/2009

Question Cognitive Level:
Memory or fundamental knowledge __X____
Comprehension or Analysis _______

10 CFR Part 55 Content: (41.5 / 45.7)

10CFR55.43.b (n/a)

Comments: New for SQN Exam 1/2009

3.0 PRECAUTIONS AND LIMITATIONS (Continued)

B. Trapping cold glycol solution between two isolated valves must be avoided. When isolating a component, close one valve only, until fluid warms up to ambient, or open a vent between the two closed valves.

C. Raw cooling water header pressure should normally be maintained greater than 40 psig to glycol chiller packages. If available, the standby RCW booster pump should be started in accordance with 0-SO-24-1 as necessary to maintain system pressure.

If NO RCW booster pump can be started, 0-SO-24-1 provides guidance on raising RCW header pressure to allow short-term operation of a few glycol chiller packages while restoring a RCW booster pump.

D. During cooldown, the differential temperature between the glycol supply temperature and the averaged measured floor surface temperature (Appendix G), should not exceed 20°F.

E. In order to minimize sublimation, frost buildup, and ice condenser door binding problems, the Ice Condenser temp should be maintained within the optimum range of 18°F to 20°F. **[C.1]**

F. If glycol flow is left on the shutdown chiller unit, the bypass valve around the temperature control valve in the cooling water flow path must be left open at all times to prevent freezing.

G. The following apply to the AHUs:

1. Heat tracing on the AHU defrost drains must be maintained continuously while plenum temperature is below freezing. If power is lost to both heating circuits for any length of time, the drain pipes must be inspected for signs of damage due to freezing.
2. If isolation of an AHU is necessary, use the odd numbered isolation valves if possible. Even numbered return valves are used for flow balance, and they should be returned to their previous position if closure is necessary.
3. When removing an AHU from service for maintenance, open circuit breaker CB #1, so it will not unnecessarily add its defrost heat to the ice condenser during the normal defrost cycle.
4. Do not operate any AHU that is not completely assembled. When air bypasses the coils due to the front or side panels being removed, it is adding warmer air to the wall panels. All sheetmetal panels must be installed on the front and sides of the AHUs. Open CB #1, unless all sheetmetal panels are installed.

the chiller packages. During a LOCA, the automatic diaphragm valves are commanded to shut which terminates the glycol coolant flow and isolates the part of the system inside containment. The valves constitute part of reactor containment. The valve operation satisfies the requirements of 10 CFR 50 Appendix A, GDC 57 "Closed System Isolation." In addition a small check valve is included within containment which provides a passage for expanding liquid trapped between the automatic diaphragm valves thereby avoiding a destructive pressure buildup. At the same time the check valve prevents reverse flow (out of containment) and therefore also satisfies the requirements of GDC 57.

The valves are required to function under SSE and/or DBA conditions and must seal against the circulating pump head.

3. AHU Support Structure

Functional Requirements

The AHU support structure supports the Air Handling Unit package under various design conditions which are detailed below:

Design Criteria and Codes

Refer to the Design Criteria Subsection 3.8.3.

Design Conditions

Normal Operation

Deadweight loads due to AHU, structure, transformer	2500 lbs
Design temperature, min.	15°F

Accident conditions

Post-Accident Temperature (no uplift)	190°F

6.5.7.2 System Design

1. Air Handling Units

Each AHU is supported from its support structure, transmitting its major loads to top deck cross beams. See the AHU Support Structure Design Criteria for additional details.

The air is drawn by each AHU from the upper plenum, is cooled in the AHU and is discharged into the air distribution header. The design gross cooling capacity of each AHU package is 30,000 BTU/hr with the plenum air entering at 19°F maximum and cooled by the AHU to 10°F nominal. Each package has a nominal 2400 CFM air delivery capacity. The entering glycol mixture is at -5°F nominal temperature and the discharge glycol temperature is 0°F nominal. These glycol temperatures may vary as needed to maintain the desired ice condenser temperature. The optimum normal operating temperature of the ice condenser has been demonstrated to be 19°F in order to minimize concrete expansion, floor heaving, and frost buildup. Electrical power is provided for fan motor and defrost heaters as well as for temperature control circuits.

I. **PROGRAM:** OPERATOR TRAINING

II. **COURSE:** SYSTEMS TRAINING

III. **TITLE:** ICE CONDENSER SYSTEM

IV. **LENGTH OF LESSON:** 2 hour lecture; 1 hour simulator demonstration;1 hour self-study/workshop.

V. **TRAINING OBJECTIVES:**

A. Terminal Objective:
Upon completion of this lesson and others presented, the student should be able to apply the knowledge to support satisfactory performance of the tasks associated with the Ice Condenser system in the plant and on the simulator.

B. Learning Objectives:

0. Demonstrate an understanding of NUREG 1122 knowledge's and abilities associated with the Ice Condenser system that are rated $\geq$ 2.5 during Initial License Training for the appropriate license position as identified in Appendix A.
1. State the purpose/functions of the Ice Condenser system as described in the FSAR.
2. State the design basis of the Ice Condenser system in accordance with the SQN FSAR.
3. Explain the purpose/function of each major component in the flow path of the Ice Condenser system as illustrated on a simplified system drawing.
4. Describe the following characteristics of each major component in the Ice Condenser system:
   a. Location
   b. Power supply (include control power as applicable)
   c. Support equipment and systems
   d. Normal operating parameters
   e. Component operation
   f. Controls
   g. Interlocks (including setpoints)
   h. Instrumentation and Indications
   i. Protective features (including setpoints)
   j. Failure modes
   k. Unit differences
   l. Types of accidents for which the Ice Condenser system components are designed
   m. Location of controls and indications associated with the Ice Condenser system in the control room and auxiliary control room

V. TRAINING OBJECTIVES (Cont'd):

B. Learning Objectives (Cont'd):

5. Describe the operation of the Ice Condenser system:
    a. Precautions and limitations
    b. Major steps performed while placing the Ice Condenser system in service
    c. Alarms and alarm response
    d. How a component failure will affect system operation
    e. How a support system failure will affect Ice Condenser system operation
    f. How a instrument failure will affect system operation
6. Describe the administrative controls and limits for the Ice Condenser system:
    a. State Tech Specs/TRM LCOs that govern the Ice Condenser
    b. State the ≤1 hour action limit TS LCOs
    c. Given the conditions/status of the Ice Condenser system components and the appropriate sections of the Tech Spec, determine if operability requirements are met and what actions are required
7. Discuss related Industry Events
    - SQN, Licensee Event Report, 327-92007, Numerous ice condenser lower doors found inoperable. 27 of 48 lower ice condenser doors were found inoperable on U-2.
    - SQN, Licensee Event Report, 327-92023, 12/31/1992, Low ice condenser weights result in operation outside of design basis.

VI. TRAINING AIDS:

A. Classroom Computer and Local Area Network (LAN) Access
B. Computer projector
C. Simulator (if available)